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ASSESSMENT OF ANXIETY IN YOUTH: A CONFIRMATORY FACTOR ANALYSIS STUDY OF CONSTRUCT VALIDITY USING MULTITRAIT-MULTIMETHOD MODELS

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DEDICATION

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ASSESSMENT OF ANXIETY IN YOUTH: A CONFIRMATORY FACTOR ANALYSIS STUDY OF CONSTRUCT VALIDITY USING MULTITRAIT-MULTIMETHOD MODELS

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This dissertation examines the construct validity of separation anxiety disorder, social phobia, and generalized anxiety disorder (GAD) in a sample of clinically anxious children. Participants were 572 children, 6 to 17 years old (294 boys) who consented to participate in anxiety assessment and treatment. Data for 85% of the sample came from a federally-funded, multi-site RCT. The remaining 15% came from an intervention enhancement study conducted at a mental health clinic associated with a large public university. Clinician ratings of child anxiety were obtained from the Pediatric Anxiety Rating Scale (PARS) and the Anxiety Disorders Interview Schedule for Children and Parents (ADIS: C/P). Parent and child ratings of symptom severity were examined using the Screen for Child Anxiety and Related Disorders (SCARED) and the Multidimensional Anxiety Scale for Children (MASC). Discriminant and convergent validity were assessed using confirmatory factor analytic (CFA) techniques to test a

multitrait-multimethod (MTMM) model. CFA analyses of the data supported the conceptualization of child anxiety as three separate traits. Separation anxiety disorder, social phobia, and GAD can be reliably differentiated in children. Discriminant validity of traits was supported because the three anxiety disorders showed meaningful divergence in the data by trait. Convergent validity of traits was also supported because the three-trait model fit the data considerably better than a no-trait model. Further, evidence for discriminant validity of methods showed that each informant provided unique information about anxiety symptoms. The best model fit was obtained for a subsample of 314 children younger than age 11. A review of factor-loadings for this model showed that separation anxiety and GAD were best measured by parent reports, and the clinician report had the strongest influence on social phobia. Specifically, each of three subscales of the SCARED-P and the ADIS: C/P for social phobia proved to be the most informative evaluation tools. As a result of this analysis, clinicians may be more confident that the current classification system of anxiety disorders is accurate and that discordant informant reports encountered in practice are more a reflection of unique perspective than of poor construct validity.

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CHAPTER 1: INTRODUCTION

Pediatric anxiety is not a straightforward construct. It involves biological, cognitive and behavioral components (Weems & Stickle, 2005) and encompasses a diversity of symptoms. At its core, anxiety in youth[1] is manifested as uncontrollable anxious thoughts and feelings, and behavioral avoidance. There are multiple theories as to the factors affecting the development and maintenance of anxiety symptoms in youth. In addition to cognitive theories, these include temperamental theories, those focused on attachment and early childhood experiences, and more integrative theories pointing to a variety of converging influences at individual, family and community systemic levels.

Evaluating and addressing anxiety concerns in children requires a great deal of resources from schools, primary care physicians' offices, and behavioral health clinics. In fact, there is strong evidence that anxiety disorders are the most common mental health diagnoses for youth (Rapee, Schniering, & Hudson, 2009). Investigations into the prevalence of anxiety show that approximately 10-21% of children report clinical levels of anxiety, and females are more likely to report anxious symptoms than males (Kendall, Safford, Flannery-Schroeder, & Webb, 2004). Clinically impairing pediatric anxiety interferes with a child's ability to function at home, at school and with peers. It can have potentially adverse long term effects including serving as a risk factor for the development of later depression (Kendall et al., 2004).

Youth with primary diagnoses of anxiety often suffer from comorbid conditions as well. The most commonly occurring secondary diagnoses are other anxiety disorders, depression, and

[1] For this paper, "youth" is defined as school-aged children and adolescents between the ages of 6 and 17.

externalizing disorders (Silverman & Ollendick, 2005). The overlap between anxiety and depression has been studied extensively; there was some debate about if the two were actually distinct disorders (Franco, Saavedra, & Silverman, 2007). The Tripartite Model of internalizing disorders proposed that anxiety and depression are distinct, and also both a function of a higher order factor of Negative Affect (Clark & Watson, 1991).

The current DSM-V classification system specifies separate anxiety disorder diagnoses including those known as the "big three" anxiety disorders (generalized anxiety disorder (GAD), social phobia, separation anxiety disorder) which are most prevalent in youth and respond similarly to treatment with cognitive behavior therapy. Because of high levels of comorbidity and perceived overlap in symptoms of these three anxiety disorders, researchers have questioned (as earlier, with depression) if separate anxiety disorders can be truly differentiated in childhood (Silverman & Ollendick, 2005).

There are many different approaches available for assessing anxiety in youth. Structured diagnostic interviews, semi-structured interviews focusing on symptoms and severity, and self and parent report questionnaire measures are all capable of providing information to help conceptualize an individual child's anxiety. Research shows that correspondence between informants is low (De Los Reyes & Kazdin, 2005), raising questions about which reporters provide the most valid information. Best practice is to use multiple methods and informants, but having myriad sources of information to integrate is burdensome.

Currently available anxiety assessment measures have provided evidence for discriminant and convergent validity of a global pediatric anxiety construct (Myers & Winters, 2002). Various anxiety symptom self-report measures are highly correlated. Semi-structured diagnostic interviews and clinician ratings of anxiety also correlate with informant report measures. In addition, research

has shown that these measures are capable of differentiating anxiety and externalizing disorders, and are often also able to discriminate between anxiety and depression.

There is less evidence of construct validity at the individual anxiety disorder level. Examinations of convergent validity have shown that the subscales of some self-report measures correlate highly. Two studies have also shown that GAD can be reliably distinguished from other disorders (Dierker et al., 2001; Muris, Dreessen, Bögels, Weckx, & van Melick, 2004).

Several investigations into the factor structure of various anxiety assessment measures have been completed. Results show that data often fits models comprised of three or more first order factors along with a higher-order global anxiety factor. More recently, researchers have also found support for bi-factor models (DeSousa et al., 2014). There is a gap in the literature because, with few exceptions (e.g. Langer, Wood, Bergman, & Piacentini, 2010; Renno & Wood, 2013), researchers have yet to investigate more than one method and informant in the same analysis.

The purpose of this study was to use confirmatory factor analysis (CFA) methods to investigate validity of the big three anxiety disorders. Ultimately, a series of Multitrait-multimethod (MTMM) models of several anxiety measures were analyzed in order to determine the best fitting model overall.

A sample comprised of two data sources was utilized; the Child and Adolescent Anxiety Multimodal Study (CAMS; (Walkup et al., 2008) NIMH trial (N=488) and the Childhood Anxiety Treatment Enhancement Study (CATES) (N=84) being conducted at the Texas Child Study Center in collaboration with The University of Texas at Austin. The CAMS study was supported by NIMH Grant # U01 MH64089 to Johns Hopkins University. The ClinicalTrials.gov identifier is NCT00052078. Institutional Review Board (IRB) approval for the CATES study was obtained from The University of Texas at Austin (Study Number: 2012-05-0009).

The initial MTMM model investigated in the present study was comprised of three trait factors (GAD, separation anxiety disorder, and social phobia) and three method factors (clinician, parent and child report) that were allowed to correlate freely. Next, three subsequent nested models were examined to test for evidence of convergent and discriminant validity.

For each model, clinician reported indicators were the Clinician Severity Ratings (CSR) of each of the three disorders based on the Anxiety Disorders Interview Schedule for DSM-IV Child & Parent versions (ADIS-C/P), and the total score for the Pediatric Anxiety Rating Scale (PARS). The ADIS CSR was considered an ordinal variable for the analysis. The parent and child reported indicators in the model were subscales from the Multidimensional Anxiety Scale for Children (MASC) and Screen for Childhood Anxiety and Related Disorders (SCARED) that loaded onto each of the trait factors.

Research questions

This dissertation answered the following research questions:

1. Should youth anxiety be conceptualized as one general factor, three separate anxiety traits, or something else?
2. Do the different raters provide redundant information or add unique elements to the conceptualization of a child's anxiety? Which informants provide the most accurate information about a clinically anxious child's latent baseline level of anxiety?
3. Which specific measures are most predictive of each type of anxiety?
4. Are there differences in means for each measure, and overall model fit for youth in Middle Childhood (ages 6-10) as compared to Adolescents (ages 11-17)?
5. Are there differences in measure means and overall model fit for girls and boys?

Results and the accompanying discussion will provide evidence that the three types of anxiety as differentiated in the DSM-V are separable for the children in the current sample. Findings from this study will provide clinicians with information about which measures should be prioritized in baseline assessment batteries, and which indicators of child anxiety should be used less frequently. Finally, results from this study provide a foundation for future research. With an understanding of the strongest measures of latent baseline anxiety, researchers may confidently test structural equation models examining a variety of influences on latent anxiety.

This manuscript reflects the views of the author and may not reflect the opinions or views of the CAMS Study Investigators or the National Institute of Health (NIH).

CHAPTER 2: REVIEW OF THE LITERATURE

Anxiety description

According to (Barlow, 2004) anxiety is a "future-oriented emotion characterized by perceptions of uncontrollability and unpredictability over potentially aversive events" (p. 104). Anxiety becomes clinically significant when it is excessive or developmentally inappropriate (Marks, 1987). It is a response to perceived danger that involves biological, cognitive and behavioral components (Weems & Stickle, 2005).

Biology. One key feature of the expression of anxiety is attention to one's own affective or physiological response to potentially aversive events, such as stomachaches or feeling like one's heart is racing (Ginsburg, Riddle, & Davies, 2006). From an evolutionary perspective, anxiety is an adaptive brain response that has helped ensure survival through prompting fight or flight behavior in the face of actual danger (Beesdo, Knappe, & Pine, 2009).

Cognition. In addition to the biological component, anxiety has a cognitive component. An anxious cognitive style has been described that includes attributing threat to and anticipating distress in ambiguous situations (Creswell & O'Connor, 2006). Anxious thoughts have also been characterized as overestimating danger and fear while also underestimating one's ability to cope in the face of threats (Bögels & Zigterman, 2000). Often termed "cognitive errors", thoughts uniquely related to anxiety, even when controlling for comorbid depression include: catastrophizing (i.e. expecting the worst possible outcome), overgeneralization (i.e. expecting that because something was the case once, it will always be the case), and personalization (i.e. misattributing control over a negative outcome to an internal cause) (Weems, Berman, Silverman, & Saavedra, 2001). A related cognitive process that has been identified in anxiety is

attentional bias. Vasey, Daleiden, Williams, and Brown (1995) showed that children with anxiety disorders demonstrate biased attention to threat words versus neutral words.

Behavior. Anxiety and its associated symptoms (e.g. physiological response, worry, oversensitivity, etc.) is often not pathological; it becomes maladaptive when behaviors associated with these worries interfere with functioning (Beesdo et al., 2009). Youth who meet diagnostic criteria for an anxiety disorder often avoid feared but neutral situations, or if absolutely necessary, endure them with intense fear and discomfort. Specific behaviors that characterize anxiety (e.g. avoidance and withdrawal) accompany anxious somatic reactions and worry thoughts out of proportion to actual threat.

Influences on the Development of Anxiety

Initial models about the development of anxiety disorders tended to be divided by theoretical camps, and limited to belief in the influence of a primary process. Manassis and Bradley (1994) reviewed two of these early theories and attempted to formulate a more integrated model.

Temperament. This camp suggested that a genetic predisposition to having a lowered threshold to the unfamiliar lead to high sympathetic arousal, withdrawal, and behavioral inhibition which resulted in clinical anxiety in the absence of effective coping.

Attachment. This group, on the other hand, saw the development of anxiety as more interpersonal in nature. These theorists posited that an insecure attachment with one's primary caregiver lead to faulty internal working models that are strengthened and maintained in subsequent interactions with others, resulting in an anxious state of inner insecurity (Manassis & Bradley, 1994). There is empirical support for this model, showing that anxious/resistant attachment significantly predicted child/adolescent anxiety even when maternal anxiety and child temperament were controlled for (Warren, Huston, Egeland, & Sroufe, 1997).

Cognitions. One of the most studied and applied models of anxiety is the cognitive model (J. S. Beck, 1995; A. T. Beck, Emery, & Greenberg, 2005). This model explains anxiety as resulting from faulty cognitive schemas or beliefs that predispose individuals to process ambiguous information in a biased way. For example, the worry-fraught self-talk of anxious youth causes them to pay more attention to threatening stimuli than safety cues (A. T. Beck et al., 2005). In addition, worrisome mental imagery reinforces and helps maintain anxious symptoms. The cognitive model emphasizes the relationship between these inaccurate cognitive appraisals and one's feelings and behavior. It suggests that core feelings of vulnerability lead to anxious self-talk which elicits somatic feelings of anxiety and triggers specific behaviors such as avoidance or escape.

Nomological net. Weems and Stickle (2005) proposed an integrative theoretical model or "nomological net" suggesting that childhood anxiety emerges from a combination of biological, cognitive, behavioral and interpersonal or social influences. The authors posited that both etiology and treatment of a particular child's anxiety may be related to any one or any number of these processes, as well as his or her developmental age. For example, the normal developmental process of realizing autonomy from parents in early elementary school could be a potential trigger for the development of separation fears (Weems & Stickle, 2005). Pine et al. (2011) also recognized the critical importance of development to etiological explanations of anxiety. They suggested that pediatric mental illness is always either a failure of mature behaviors to develop (e.g. typical developmental fears are over-exaggerated) or a failure of immature behaviors to disappear (e.g. typical developmental fears are not extinguished). In these models, a child in the developmental stage of becoming autonomous is at increased risk of developing separation anxiety if parenting behaviors facilitate avoidance of separation and/or if the child's anxious cognitions about separation are reinforced.

Ollendick and Benoit (2011) provided a detailed explanation of the separation anxiety example. They suggested that child temperament (biological influence) and information processing biases (cognitive influence), parent anxiety and parenting practices (behavioral influence), as well as attachment processes between parent and child (interpersonal influence) all affect the onset and maintenance of separation anxiety. Similarly, Wood, McLeod, Sigman, Hwang, and Chu (2003) pointed out that these four categories of influence may be separately involved in both the development and maintenance of child anxiety. For example, genetic traits or temperament (biology) may be a causal factor in a particular child's anxiety whereas his mother's controlling behavior (interpersonal) is a maintaining factor.

Systems influence. Rapee et al. (2009) also summarized research regarding a number of potential risk factors to the development of youth anxiety. In reading their review, it is helpful to think of influences at the child, family and broader community levels. Within the child, authors pointed to inhibited, shy or withdrawn temperament, information-processing biases, and avoidant coping as predictors of anxiety. In examining family influences, the authors confirmed evidence on the influence of anxious/ambivalent attachment, overprotective parenting, and parental expression of anxiety through both modeling and verbal messages. The role of the family was further delineated in a comprehensive review conducted by Wood et al. (2003) that examined evidence specifically linking parenting style (which could include acceptance, control and modeling) and parenting behaviors (such as frustration, accommodation, reinforcement) to child anxiety. Authors concluded that although it is impossible to determine directionality, controlling parenting behaviors were consistently related to child anxiety (Wood et al., 2003).

Beyond the role of family relationships, Rapee et al. (2009) also pointed to twin studies aiming to differentiate the role of genes vs. family influences. These studies concluded that more variance is accounted for by differential environmental factors than by shared genetic or

environmental experiences (Gregory & Eley, 2007). Finally, outside the family, Rapee and colleagues (2009) reviewed limited research about the role of experiential and conditioning factors, as well as the effects of chronic adversity and negative life events on the development of anxiety.

Prevalence and Course of Anxiety in Youth

There is strong evidence that anxiety disorders comprise the most common mental health diagnoses for youth (Rapee et al., 2009). Most epidemiological research has focused on children and adolescents older than six. However, the PAPA Test-Retest study conducted with families from a large diverse primary care clinic showed that 9.4% of young children between the ages of two and five met criteria for a DSM-IV anxiety disorder (Egger & Angold, 2006). In examining the data for older children and adolescents, Costello, Egger, and Angold (2005) reviewed 22 studies of anxiety prevalence and showed that 12-month estimate s range from 8.6% to 20.9%. Similarly, Kendall et al. (2004) reported that approximately 10-21% of children report clinical levels of anxiety. At any given time, it is estimated that between 2.5 and 5% of children and adolescents meet diagnostic criteria for an anxiety disorder (Rapee et al., 2009). Further, research has consistently shown that girls are more likely to report anxiety than boys, and that this difference emerges by age six (Lewinsohn, Gotlib, Lewinsohn, Seeley, & Allen, 1998).

Research suggests that the majority of childhood anxiety disorders do not remit over time and in fact, up to 50% of anxious adults report having experienced anxiety as children (Kendall et al., 2004). Schniering, Hudson, and Rapee (2000) summarized the limited research on the stability of anxiety disorders in youth over time. They concluded that when untreated, childhood anxiety fluctuates rapidly in both severity and focus, and that specific anxiety diagnoses are not very stable over time. Among children, they reported it is not uncommon to have one anxiety diagnosis dissipate and another develop (Schniering et al., 2000).

Effects of Anxiety in Youth

Childhood anxiety can interfere with typical development in several different domains. As in other internalizing disorders, anxiety has been shown to be associated with broad psychosocial impairments (Farrell & Barrett, 2007). According to Rapee et al. (2009), anxiety impacts family processes, peer and school functioning, and recreation patterns in youth. Similarly, Langley, Bergman, McCracken, and Piacentini (2004) reported that anxiety interferes with children's functioning in a global sense because it can affect family relationships and sleep routines, school attendance and concentration, and one's ability to develop and maintain friendships. In addition, Kendall et al. (2004) reported that anxiety is a risk factor for the development of later depression or other psychopathology and also pointed to a potential link between childhood anxiety and later substance use.

Defining Anxiety in Youth: The Big Three Anxiety Disorders

Although anxiety in children and adolescents is typically characterized by a variety of symptoms encompassing several so-called specific comorbid anxiety disorders (Pine, 2011), there are three narrowly defined anxiety disorders that are most often researched together in youth. Known as the "big three" anxiety disorders, they are separation anxiety disorder, social phobia (social anxiety disorder) and generalized anxiety disorder (GAD). These three are most prevalent in youth, respond similarly to CBT, and have several overlapping symptoms. Silverman and Ollendick (2005) pointed out that the three share similar processes of apprehension and avoidance, and only really differ in the content or focus of worry.

Separation anxiety. Most commonly seen in younger children, with onset in middle childhood (Last, Perrin, Hersen, & Kazdin, 1992) separation anxiety is characterized by irrational fears about the safety of one's attachment figure (or one's self when apart from that figure). It often manifests as persistent refusal or extreme distress upon separation or anticipated

separation from the attachment figure. According to Cohen et al. (1993) prevalence rates for separation anxiety decline with age, decreasing 23% for each year after age 10. These authors found the highest average prevalence rate for 10-13 year old females (13.1%) and the lowest for 14-16 year old males (1.2%).

Social anxiety disorder (social phobia). Social anxiety disorder is more prevalent in adolescence, with onset around 16 years of age (Last et al., 1992). It involves irrational fears of negative evaluation by others and is often (but not always) characterized by avoidance of performance or social situations due to overwhelming fears of embarrassment and humiliation. Social Phobia is estimated to affect 13% of the general population over the life span (Compton, Nelson, & March, 2000).

Generalized anxiety disorder (GAD). GAD is the most common anxiety disorder (Costello et al., 2005). It is diagnosed when a child experiences uncontrollable worry, and fears many more things or situations than are developmentally appropriate. The experience of GAD worries is most often associated with a physical component such as muscle tension or fatigue.

Historical evolution of diagnostic categories. Over the last 35 years, since they were included as separate disorders in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III), researchers have grappled with trying to determine the most accurate methods of identifying and measuring these three anxious profiles, while simultaneously assessing the accuracy of their classification as separate from one another.

Saavedra and Silverman (2002) outlined the changes to conceptualization of anxiety in children and adolescents from the second version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-II) to DSM-IV. The authors explained that in 1968, DSM-II had only one broad category to describe anxiety: “overanxious reaction”. In the DSM-III, however, psychiatrists recognized that the pattern of anxiety in youth was different from adults, and created the category

"Anxiety Disorders of Childhood and Adolescence". Separation anxiety disorder was included for the first time, along with diagnoses entitled "avoidant disorder", which was the child version of social phobia (Bögels et al., 2010) and "overanxious disorder", which resembled both adult GAD and social phobia. Social phobia and GAD were also listed in the DSM-III, as anxiety disorders more applicable to adults. DSM-III-R didn't see many changes beyond combining phobic and anxious disorders for adults, and adding an "anxiety not otherwise specified" category.

Although somewhat out-of-sync with the research base showing the importance of the developmental perspective, (Pine, 2011) the introduction of DSM-IV meant a whittling down of the childhood-specific diagnoses. Only separation anxiety disorder remained in the category known as "Other Disorders of Infancy, Childhood or Adolescence". Social phobia (also known as social anxiety disorder starting with this version of the DSM) and GAD also persisted under the main heading of "anxiety disorders". Research had shown that avoidant disorder could not be reliably distinguished from social phobia and so it was dropped in DSM-IV (Spence, 1997).

DSM-V. For the most recent revision, resulting in the fifth edition of the DSM, none of the anxiety disorders are restricted to youth. In acknowledgment of the fact that core features of disorders may vary as a function of development, authors infused some developmental variation into the descriptions of diagnostic criteria for youth and adults. Notable differences include: the duration of symptoms required for a separation anxiety diagnosis is much shorter for children than adults, a childhood GAD diagnosis only requires one symptom associated with worry (as opposed to three for adults), and a social phobia diagnosis is only warranted in children when fears extend to both peers and adults. A separate list of ways social fears may be expressed in children (e.g. tantrums, failing to speak) is also included in the diagnostic criteria for social phobia. DSM-V criteria for the "big three" anxiety disorders are listed in the Appendix.

Comorbidity

Research has demonstrated that high rates of internalizing comorbidities exist on initial assessment with children and adolescents (Kovacs & Devlin, 1998). One treatment study of anxiety disordered children showed that 79% of the sample had at least one comorbid diagnosis (Kendall, Brady, & Verduin, 2001). In studies of primary anxiety diagnoses such as these, specifically, it has been consistently shown that the most commonly occurring secondary disorders are other anxiety disorders, depression, and externalizing disorders (Silverman & Ollendick, 2005). Less is known about the association between anxiety and comorbid externalizing conditions; that research will be reviewed first.

ADHD and externalizing disorders. In a large review of both epidemiological studies and those using clinic samples, Russo and Beidel (1994) found that rates of comorbid externalizing diagnosis accompanying an anxiety diagnosis consistently exceeded chance in epidemiological studies and co-occurred at a rate of 2-21% for clinic samples. Verduin and Kendall (2003) investigated differences in comorbidity for 199 children with primary anxiety disorders and found 17% of them to have co-occurring externalizing disorders. The externalizing diagnosis that has received the most attention alongside anxiety is attention-deficit/hyperactivity disorder (ADHD). Anxiety and ADHD share several of the same symptoms, including restlessness, sleep disturbance and difficulty concentrating, and it can be challenging to tease the two apart methodologically. Across studies, Jarrett and Ollendick (2008) reported an average comorbidity rate of 25% for anxiety and ADHD.

Multiple anxiety disorders. Last, Strauss, and Greta (1987) examined 73 consecutive admissions to an anxiety disorders clinic and found that comorbidity among the different types of anxiety disorders was quite high. Anderson (1994) concluded that approximately 50% of clinically anxious children meet diagnostic criteria for more than one anxiety disorder. In fact,

comorbidity among anxiety disorders has been found to be high in both clinical and community samples (Costello et al., 2005). Costello and colleagues (2005) reviewed six large data sets to learn more about overlap between the anxiety disorders. They found significant comorbidity among social phobia and specific phobias, and social phobia and the old diagnosis of OAD. Separation anxiety was not found to be linked to social phobia or overanxious disorder. High rates of comorbidity among anxiety diagnoses is potentially problematic because it could indicate that the separate diagnostic categories are not validly distinct entities.

Depression. As the two most prevalent disorders of mood and emotion, anxiety and depression and their overlap have been extensively studied. Last et al. (1987) found that 15% of the children admitted to an anxiety disorders clinic actually met criteria for a primary depressive diagnosis, often with secondary anxiety as well. Similarly, Angold, Costello, and Erkanli (1999) conducted a meta-analysis of community sample based studies and determined that childhood depression was 8.2 times as likely in the presence of an anxiety disorder as compared to cases with no anxiety.

Several researchers have suggested that the overlap between anxiety and depression is problematic, because, as with multiple comorbid anxiety diagnoses, it is unclear if the comorbid anxious-depressed condition is actually a distinct disorder (Costello et al., 2005). Wadsworth, Hudziak, Heath, and Achenbach (2001) showed that an examination of data from 1,987 parent reports on child behavior best fit a unified anxious-depressive disorder. This is somewhat unsurprising since anxiety and depression both predict the development of one another and both respond to cognitive behavior therapy (Costello et al., 2005).

Franco et al. (2007) set out to determine if there is a true distinction between more “pure” anxieties and depression, and the comorbid disorder. Franco and colleagues concluded that the comorbidity is an unquestionably real and true phenomenon most likely linked to severity of

pathology. Kovacs and Devlin (1998) and Angold et al. (1999) had come to the same conclusion earlier; those authors reported that the comorbid pattern is unique from each pure disorder in that the combination is more severe, more common in older adolescents, and more likely in cases of accompanying parental psychopathology.

Tripartite Model of internalizing disorders. Clark and Watson (1991) posed the Tripartite Model to explain internalizing disorders; they suggested that anxiety and depression are both a function of a higher order factor of Negative Affect, and another factor unique to each disorder (Physiologic Hyperarousal for anxiety and Low Positive Affect for depression). Several researchers have examined this theoretical model to help clarify if the two disorders can be differentiated, and if so, to explain the nature of the distinction between them.

Chorpita, Plummer, and Moffitt (2000) found that their data did not exactly fit the factor structure proposed by the Tripartite Model. Namely, although Negative Affect was indeed part of anxiety (GAD specifically), it was not related to depression as hypothesized. In addition, Low Positive Affect, although related to depression as predicted, was also related to social anxiety. Finally, surprisingly, the Physiologic Hyperarousal factor was not correlated with the GAD dimension (Chorpita et al., 2000). In a follow-up study building on the first, Chorpita (2002) concluded that Negative Affect was in fact positively related to dimensions of both anxiety and depression. Examination of the Physiologic Hyperarousal factor in this study suggested that it may be related to both anxiety and depression, but the best fitting model showed that only Panic Disorder, a specific kind of anxiety separate from the "big three", loaded on Physiologic Hyperarousal. Across studies, most evidence has supported a hierarchical organization of internalizing disorders with the higher-order factor of Negative Affect helping to explain both anxiety and depression (Trosper, 2011). However, there is less support for unique contributions of

the Physiologic Hyperarousal and Low Positive Affect factors of the Tripartite Model of internalizing disorders.

Assessing Anxiety in Youth: A Review of Measures

Accurate assessment of anxiety is crucial for informing diagnosis and treatment, and also for research purposes (Schniering et al., 2000). If anxiety isn't reliably assessed in youth, then it is not possible to compare diagnostic and outcome findings across studies (Silverman & Ollendick, 2005). It is widely accepted that data from multiple informants is essential for accurate and effective assessment (Grigorenko, Geiser, Slobodskaya, & Francis, 2010). Various methods for assessing anxious symptoms, severity and diagnostic information in youth exist; there are myriad ways that clinicians and researchers gather information from children, their parents and other informants such as teachers or therapists. What is still unclear, however, is if assessors gain incrementally meaningful information when they evaluate anxiety at the symptom, severity and diagnostic levels relative to assessing at any one of these levels in isolation.

Methods used to assess anxiety in youth include structured and semi-structured diagnostic interviews with children and their parents (either conducted alone or separately), informant-report questionnaires completed by children, their parents or their teachers, clinician ratings, and finally, behavioral or observational assessments. Each of these methods are widely used despite each having different purposes and unique limitations.

Best practice is to use multiple methods and multiple informants to assess anxiety. Multiple methods are recommended because measures are all limited in different ways, but when taken together, a group of measures is less biased on average than any single measure alone. Multiple informants are often consulted because parent and child perspectives on a child's problems tend to vary considerably and clinicians don't want to miss problems that are significant from either perspective (Yeh & Weisz, 2001). Clinically, both perspectives are important because research has

shown that when children and parents agree that a child has clinically significant anxiety, there are superior treatment gains as compared to when the parent endorses anxiety and the child does not (Panichelli-Mindel, Flannery-Schroeder, Kendall, & Angelosante, 2005). However, as Ebesutani, Bernstein, Chorpita, and Weisz (2012) pointed out, there is considerable burden in collecting multiple reports from multiple informants; administration burden for both the clients and clinic, and also interpretation burden for the assessor tasked with making sense of all the data. Indeed, comparing and incorporating anxiety assessment data can be challenging as reports from different informants often vary a great deal (Choudhury, Pimentel, & Kendall, 2003; Birmaher et al., 1997; Barbosa, Tannock, & Manassis, 2002). According to Baldwin and Dadds (2007), this may be because parents struggle to perceive the internal states of their children, and children often have difficulty communicating about internal states to their parents.

Silverman & Ollendick (2005) advocated using the "pragmatic criterion" to determine the utility of each potential measure given the specific context and the goal of the assessment. For example, it is not practical to use a structured diagnostic interview if the goal is simply to screen youth for potentially elevated anxiety. These types of interviews are extremely useful at quantifying symptoms and behaviors, however, and thus are quite pragmatic when the goal is treatment planning. Wei et al. (2014) also pointed to the importance of considering the setting in which the assessment will be conducted; since clinical interviews require in-depth training and are quite time consuming, for example, they are less appropriate than rating scales in school and primary care contexts.

In the next sections, a review of some of the most commonly used anxiety assessment methods and measures is presented. Clinical interviews, self and informant report measures, and clinician ratings are discussed. Recommendations for appropriate circumstances for utilizing each are included. Significantly less attention has been paid to physiological and behavioral methods of

assessing anxiety; they are not included in this discussion. In short, physiological methods of assessment such as measuring cardiovascular responding, is possible, but not common. Behavioral measures include direct observation and behavioral avoidance tests; the interested reader is referred to Schniering et al. (2000) for more information.

Clinical interviews. Structured and semi-structured diagnostic interviews based on the most recent classification system are the most prominent assessment method reviewed in the literature and are almost universally utilized in research since they are particularly useful for making diagnoses (RUPP, 2002; Saavedra & Silverman, 2002). Interviews range from highly structured to semi-structured. Some cover a wide range of disorders and include sections about anxiety (e.g. NIMH Diagnostic Interview Schedule for Children Version IV (DISC-IV: Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) and Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS: Ambrosini, 2000)). The Anxiety Disorders Interview Schedule for DSM–IV: Child and Parent Versions (ADIS-IV: C/P: Silverman & Albano, 1996) emphasizes anxiety and screens for other disorders. The ADIS-IV assesses severity of individual anxiety disorders. Across studies, inter-rater reliability for determining diagnoses using these interviews has been shown to be moderate to high (Schniering et al., 2000) and test-retest reliability has proven to be good to excellent (Saavedra & Silverman, 2002). Of all available diagnostic interviews, the ADIS-IV has demonstrated the strongest evidence for reliability and validity (Silverman, Saavedra, & Pina, 2001), and has been the most frequently used in the anxiety treatment outcome literature. Of 24 outcome studies reported between 1994 and 2004, the ADIS-IV was used 15 times (Silverman & Ollendick, 2005).

Self and informant report rating scales. Rating scales are a preferred method of assessment because they are quick and easy to administer, are often inexpensive, and provide normative information that can be used to understand the magnitude of a youth's internal

experience of anxious symptoms or behaviors (Schniering et al., 2000). Rating scales are most useful for screening or monitoring changes over time as they capture symptom frequency well, but do not assess impairment directly (Ginsburg, Siqueland, Masia-Warner, & Hedtke, 2004; RUPP, 2002).

Self-report. Self-report measures for anxious youth have been utilized for quite some time, but the earliest versions were just downward extensions of adult questionnaires. Examples of such scales that assess a broad range of symptoms include the State-Trait Anxiety Inventory for Children, first published in 1973 (STAI-C; Spielberger & Edwards, 1973), which assesses different domains of anxiety but doesn't cover all of the diagnostic criteria, and the Revised Children's Manifest Anxiety Scale (RCMAS: Reynolds & Richmond, 1978; Reynolds & Richmond, 1985), which has three factors (physiological manifestations of anxiety, worry and oversensitivity, and concentration/social concerns) but also includes items monitoring attention and impulsivity. White and Farrell (2001) compared the factor structure of the RCMAS to an expert-derived theory-driven model of anxiety, and noted that certain areas were missing from the items in the RCMAS including anxious apprehension and behavioral avoidance. Although the RCMAS has been extensively utilized in research, some have suggested it measures distress rather than anxiety. Indeed, although these older scales have acceptable internal and test-retest reliabilities, they are outdated, and not developmentally sensitive, and their clinical utility has been questioned (Myers & Winters, 2002; Grills-Taquechel, Ollendick, & Fisak, 2008).

Both available since 1997, the Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, & Conners, 1997) and the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997) have been widely used. These two scales both have a self-report and parent report version, each can be completed and scored in less than 30 minutes, and both have demonstrated adequate psychometric properties (Myers & Winters, 2002).

An update to the MASC (MASC-2; March, 2012) was recently published as well. The new scale differs from the original in that it now includes a GAD Index. The new form has demonstrated adequate test-retest reliability and good discriminant validity (Fraccaro, Stelnicki, & Nordstokke, 2015).

A review by Silverman and Ollendick (2005) identified 18 different scales designed for assessing self-reported anxiety in children and adolescents currently in use. In addition to reporting adequate evidence for reliability, and for convergent and divergent validity of total scores, however, these authors noted several limitations to the use of these scales. One problem with self-report scales noted by the authors is that obtained scores are arbitrary and not linked to any "real life" picture of what they mean in terms of functioning. Silverman and Ollendick argue that using self-report measures in outcome studies is problematic because "clinically significant improvement" is also arbitrary. It is quantified by a significant reduction in the number of items endorsed, but no scale has articulated what the difference in clinical presentation is for a child with a symptom score above or below arbitrary clinical cutoffs.

Another limitation of using self-report measures in isolation, is that several studies have identified tendencies of anxious youth to want to present themselves as socially desirable, and to be reluctant to self-disclose information about anxious symptoms that would portray them in a negative light (Anastasi & Urbina, 1997). For this reason, children may underestimate or underreport their level of anxiety (March et al., 1997). Notably, only one self-report measure of anxiety for children includes a lie scale that attempts to catch this type of inaccurate reporting based on social desirability (the RCMAS, however, the MASC also has an Inconsistency Index). Also, self-report scales are dependent on the informant's cognitive and linguistic abilities to read and comprehend items (RUPP, 2002) and results may be influenced by gender differences or cultural factors (March et al., 1997). Finally, although self-report scales consistently discriminate

anxiety from other disorders, they have limited ability to discriminate between diagnostic subgroups of anxiety (DeSousa et al., 2014; Schniering et al., 2000; Wei et al., 2014).

Informant report. Scales designed specifically for parents to report on aspects of their child's behavior have also emerged. Some of these measures contain items that are identical to a child report version (including the MASC and SCARED). The most frequently used parent report questionnaire, however, has been the Achenbach Child Behavior Checklist (CBCL; Achenbach, 1978). The CBCL yields a variety of scales including an Internalizing Problems scale that has often been used in anxiety research.

Clinician ratings. The perspective of the clinician is often included to help clarify discrepancies between reports by other informants (Ginsburg, Keeton, Drazdowski, & Riddle, 2011). One basic example of including clinician perspective is through the clinician severity ratings on the ADIS-IV diagnostic interview. After taking into account the parent and child report about specific DSM symptom criteria, the clinician provides a severity rating for each diagnosis. A unique measure of clinician rating is the Pediatric Anxiety Rating Scale (PARS; RUPP, 2002). The PARS assesses frequency, severity and impairment of common pediatric anxiety disorders and is uniquely suited for assessing anxiety severity across more than one anxiety disorder diagnosis. One other available measure targeting severity and impairment is the Hamilton Anxiety Rating Scale (HAM-A; Hamilton, 1959). The HAM-A only assesses clinician perspective on somatic symptoms and was originally developed for adults.

Informant concordance. On the whole, numerous studies have shown low to moderate informant agreement regarding behavioral-emotional problems in youth (De Los Reyes & Kazdin, 2005; Achenbach, 2006). Differential profiles of reporting have been extensively discussed (e.g. Smith, 2007). An early meta-analysis of 119 studies reported an average correlation of .22 between parent and child reports (Achenbach, Mcconaughy, & Howell, 1987).

In general, parents from clinical samples tend to report greater levels of child problems than their children, with the opposite pattern observed in community samples (Grigorenko et al., 2010). However, children tend to report more internalizing problems than their parents. Consistent with this latter pattern, in one clinical sample of anxious African American children, the children reported higher levels of symptoms than their parents (Dirks et al., 2014). Comer & Kendall (2004) reported stronger parent-child agreement at the symptom level, particularly for observable symptoms, but noted that agreement was still weak overall.

Yeh and Weisz (2001) studied parent and child perspective of presenting problems in an outpatient clinic and found 63% of parents and children did not agree about even one problem and 34% did not agree about a single general problem area. Yeh and Weisz noted three important questions to consider when examining parent-child agreement. First, does the informant think a problem exists? Second, does the informant believe it is distressing? Finally, does the parent or child think it is what the child most needs help with? Based on these questions, it is unsurprising that reports about externalizing problems match significantly better than those for internalizing problems. Parents likely tend to attribute behaviors to internal characteristics of the children whereas the children make more situational attributions (Yeh & Weisz, 2001; De Los Reyes & Kazdin, 2005).

In addition to informants having differing views on the cause or attributions of the behavior, De Los Reyes (2011) reported that they also vary in their decision thresholds guiding whether treatment is necessary and the contexts within which the behavior is observed. He argued that informant discrepancies should reveal important information on how a child's behavior varies across situations and time and reviewed research showing that discrepancies between reporters yield knowledge not available from the individual informant reports, and are stable over time.

In terms of anxiety specifically, mother-child concordance on the total MASC score was .394 (marginally significant, $p < .051$) while father-child concordance for the same measure was .182 (not significant) (March et al., 1997). According to these authors, parents are more likely to identify symptoms that are readily observable and stable over time (March et al., 1997). In addition to discrepancies on self-report measures, diagnoses based on the ADIS-C/P have also been shown to differ significantly for the parent and child interviews (Grills & Ollendick, 2003).

Cole, Hoffman, Tram, and Maxwell (2000) concluded that both parents and children are reliable informants but provide different kinds of information from different viewpoints. When they analyzed the parent and child versions of the RCMAS together in a single factor analysis, these authors found large factor loadings across scales, suggesting that relatively equal weight should be attributed to parent and child reports when trying to integrate assessment information.

In summary, although research shows concordance rates that are moderate at best, there is a great deal of variation in interpretation of this finding. Some investigators see lack of agreement as a methodological problem, but others interpret it as a natural effect of a child's behavior varying by setting. Because not all anxiety symptoms are observable, most agree that it is necessary to assess the child's perspective as part of the evaluation.

Examining the Construct Validity of Pediatric Anxiety

Discriminant validity. Evidence of discriminant validity, that separate anxiety disorders have sufficient unique variance and can be differentiated from each other and from other diagnoses, is an important part of establishing that they are conceptually different diagnostic constructs. In other words, different traits should be relatively independent across the same and different assessment modalities/informants (Thaler, Kazemi, & Wood, 2010).

Given the high rates of comorbidity between anxiety and depression in clinical samples, it is not surprising that there is mixed evidence for discriminant validity between overall anxiety and

depression measures (Myers & Winters, 2002). In a clinical sample of youth in maintenance treatment for anxiety, March et al. (1997) showed the MASC and CDI (Children's Depression Inventory) were not significantly correlated, but the RCMAS and CDI were positively correlated ($r=.624$, $p<.01$). Ginsburg et al. (2011) showed that the PARS and the CDI were not significantly correlated in an at-risk community sample of anxious youth ($r=.14$).

More evidence of discriminant validity comes from reports that anxiety measures do not correlate with measures of externalizing disorders. For example, the PARS and SCARED both correlate significantly more with the internalizing subscale of the Achenbach Child Behavior Checklist (CBCL) than the externalizing subscale (RUPP, 2002; Muris et al., 2004). Similarly, neither the MASC child report nor the MASC parent report correlates significantly with the CBCL externalizing subscale ($r=-.17$ for child and $r=-.36$ for parents) or the ADIS-C/P clinician severity rating for behavior disorders ($r=-.17$ for child and $r=-.09$ for parents) (Thaler et al., 2010). Also, neither the MASC nor the RCMAS correlate with the Abbreviated Symptom Questionnaire (ASQ; Conners, 1995), a parent report measure of hyperactivity (March et al., 1997).

In examining specific anxiety diagnoses, there is much less evidence for discriminant validity to report. One study showed that the GAD subscale on the SCARED discriminated between children who have been diagnosed with GAD and other disorders, but that the other anxiety disorder-specific subscales did not perform as well (Muris et al., 2004). Another study showed that the MASC composite scale was able to distinguish females with GAD from those with Social Phobia, major depression and externalizing disorders (Dierker et al., 2001).

Convergent validity. Also important for determining the validity of anxiety diagnoses, is converging evidence among different ways of measuring anxiety in general, and the separate anxiety disorders specifically. Similar traits should correlate highly across different assessment modalities and informants.

Research has provided evidence of strong interrelations of independent assessment methods of the global anxiety construct. Specifically, the MASC and the RCMAS, the most widely used self-report measures, have been shown to be significantly correlated in numerous studies ($r=.59$, $p<.001$; Ólason, Blöndahl Sighvatsson, & Smári, 2004), ($r=.61$, $p<.001$; Rynn et al., 2006). The MASC child and parent reports are also correlated with the ADIS-C/P clinician severity ratings ($r=.40$ for both), and the internalizing indices from the Achenbach teacher report forms (TRF $r=.28$ for child and $r=.35$ for parents) (Thaler et al., 2010). The new MASC-2 is said to correlate with the Beck Anxiety Inventory for Youth (March, 2012). Ginsburg et al. (2011) further demonstrated that the PARS Total Score (clinician report) is positively correlated with both the parent ($r=.47$) and child ($r=.42$) versions of the SCARED in an at-risk sample of anxious youth. Other researchers found the same pattern for the PARS and the parent-version of the SCARED in a clinical sample of youth (RUPP, 2002).

Regarding convergent validity at the individual anxiety disorder level, Baldwin and Dadds (2007) showed that the MASC and the Spence Children's Anxiety Scale (SCAS; Spence, 1997) demonstrate good convergent validity by subscale for both parent and child reports (e.g. MASC-social anxiety and SCAS social phobia correlations: $r=.76$ for child reports and $r=.74$ for parent reports). Wood et al. (2003) also demonstrated that diagnoses resulting from the ADIS-C/P were correlated with scores for the MASC subscales in that children diagnosed with social phobia based on the ADIS-C/P scored significantly higher on the social anxiety subscale of the MASC as compared to children with other anxiety disorders.

Factor analysis of pediatric anxiety measures. Many researchers have used confirmatory factor analysis (CFA) to examine the fit and adequacy of different representations of items that comprise a single anxiety assessment measure. They have attempted to adequately model the factor structure of anxiety symptoms as measured by different scales to differentiate if

it is best explained as one general anxiety factor, or by a number of factors representing distinct subtypes of anxiety as delineated in the DSM-IV. In addition to comparing the fit of single and multiple factor first-order models, researchers have also examined second-order hierarchical models, and more recently, bi-factor models. Both of these models are recommended for examining the underlying factor structure of a construct comprised of several closely related domains (Wiesner & Schanding, 2013).

Bifactor models or "nested models" offer an alternative explanation to second-order (hierarchical) models. Hierarchical models have substantially correlated lower factors that are accounted for by a higher-order factor (Chen, West, & Sousa, 2006). Bifactor models have no "higher" or "lower", but rather have one general factor reflecting common variance across items, and multiple uncorrelated group factors that reflect additional shared variance over and above the general factor (Ebesutani, Bernstein, et al., 2012). Bi-factor models may also be theoretically appropriate to explain the construct of pediatric anxiety disorders since the big three anxiety disorders share a number of core features and show high rates of comorbidity, yet also have their own unique features (DeSousa et al., 2014).

Understanding the structure of anxiety has both practical and clinical utility. If lengthy measures designed to differentiate between subtypes of anxiety disorders are really just measuring one construct, they could still be effective with significantly fewer items. Indeed, after all anxiety items on the original scale were determined to reflect one broad anxiety dimension, the shortened version of the Revised Child Anxiety and Depression Scale (RCADS) contained only 15 anxiety items evenly pulled from the five original anxiety content areas (Ebesutani, Reise, et al., 2012). Additionally, determining the factor structure is important even if multiple anxiety dimensions are identified, as the dimensions may or may not approximate the diagnostic criteria of the big three anxiety disorders, and they may vary slightly by informant.

When Cole et al. (2000) compared the factor structure of the parent and child versions of the RCMAS, they found support for a three-factor solution for both the parent and child versions. However the third factor differed across informants. Specifically, both versions contained Social Alienation and Worry-Oversensitivity factors, but the third factors differed; Physiological Concerns was the third child-factor and Sleep Disturbance the third parent-factor.

Rey (2011) used CFA and examined the internal structural validity of the ADIS-IV Child and Parent interviews in a sample of 625 youth and 479 parents. She found that a five correlated factor model fit both the youth and parent data the best. In addition to three expected factors (separation anxiety, social phobia, and specific phobia), the author found separate GAD worry and GAD somatic distress factors. Therefore, results did not support the internal validity of GAD, but did support the existence of the other anxiety disorder subtypes. Whitmore, Kim-Spoon, and Ollendick (2013) also used CFA of the ADIS-IV C/P, and specifically examined if GAD and social phobia could be conceptualized as separate disorders. The one-factor model did not fit the data well. Rather, for both parent and child interviews, a two-factor correlated model and a second-order model fit the data best. The second-order model consisted of two distinct lower-order factors (GAD and social phobia) and a higher-order anxiety factor that accounts for the commonality shared by the two lower-order factors. Authors noted that the two factors were more highly correlated in child reports than in parent reports.

When March et al. (1997) examined the factor structure of the MASC with 374 school children in grades four through 12, they found a four-factor solution best explained the MASC items. Authors concluded that the MASC measures separate dimensions of anxiety, even at the sub-factor level according to the following factors: physical symptoms (divided into tense/restless and somatic/autonomic sub-factors), harm avoidance (divided into perfectionism and anxious coping), social anxiety (divided into humiliation/rejection fears and performance anxiety), and

separation anxiety, which did not subdivide. Baldwin and Dadds (2007) re-examined the factor structure of the MASC using both child self-report and parent report in a community sample of Australian school children (N=499). Results of their analysis showed a four correlated factor solution and a higher order factor solution fit both the parent and child report data well. Authors accepted the higher order factor solution as the best explanation of the intercorrelations between the four first-order factors. Grills-Taquechel et al. (2008) re-examined the factor structure with a clinically heterogeneous sample (N=262). As before, this data was a good fit with the original four-factor model. Notably, the single factor (global anxiety) model did not fit these data sets well.

Like Baldwin and Dadds (2007), researchers that examined the RCMAS also found support for a higher order model, but only after determining a more theoretically meaningful structure than that offered by the original authors. White and Farrell (2001) examined the RCMAS in a predominantly African-American community sample and accepted a best fitting model with three first-order anxiety factors: Social Evaluation/Oversensitivity, Worry, and Anxious Arousal and a second order global anxiety factor. The authors concluded that there are somewhat distinct dimensions of anxiety that reflect an overall higher order anxiety factor (White & Farrell, 2001).

Similarly, Spence (1997) examined the factor structure of a new measure, the Spence Children's Anxiety Scale (SCAS) based on self-reports of two community samples of children between the ages of eight and 12 (N=698 per sample). Once again, the single-factor model where all symptom items load strongly on one global anxiety factor did not provide a good fit for the data. Instead, a model including six discrete but correlated first-order factors and one second-order factor fit the data best. The six factors reflected panic-agoraphobia, social phobia, separation anxiety, obsessive-compulsive problems, generalized anxiety, and physical fears. Because the factors showed a high degree of covariance, Spence (1997) concluded that there are distinct

subtypes of anxiety, which are often comorbid, and that the relationship between subtypes could be explained by an underlying second-order global anxiety factor.

The same author later examined data from 755 mother-report measures of preschoolers' anxiety symptoms to see if the subtypes exist from an early age or if anxiety perhaps emerges first as one global factor (Spence, Rapee, McDonald, & Ingram, 2001). Researchers found that symptoms did in fact cluster onto the factors with enough unique variance to justify the separate categories in preschoolers. Despite extremely high correlations between some factors (e.g. separation anxiety and generalized anxiety r=.87), the accepted solution was a five-correlated factor model with a higher-order global anxiety factor explaining the covariation among the five factors. The only first-order factor present in the school-age sample but not included for preschoolers was the panic/agoraphobia factor because those items were deemed inappropriate for the younger sample.

Dirks et al. (2014) conducted separate CFAs of the five-factor model of the SCARED for the youth and parent report data of 408 parent-child dyads. Based on obtained fit indices, authors accepted the five-factor model for both youth and parents. DeSousa (2014) used the SCARED self-reports of over 2000 Brazilian school children to assess the validity of a bi-factor model. As compared to a one-factor model and the five correlated factors model, the bi-factor model demonstrated the best fit of the data. In addition, because item factor loadings showed the majority of item variance (63.96%) was due to a general factor rather than the group factors, authors suggested that the SCARED subscales provide very little reliable information about distinct anxiety dimensions after accounting for the general total score. Since only two or three items on each of the big three anxiety disorders subscales loaded higher on the specific factor than the general factor, DeSousa (2014) recommended that these items be emphasized by practitioners and potentially used by researchers as the basis for a revised or shortened version of the SCARED.

In summary, examinations of the factor structure of anxiety has been largely limited to assessment of one measure at a time. When researchers have included more than one measure or informant in their study, they have conducted multiple analyses to replicate CFA results with each subsequent measure separately. Factor structures have been established for many common anxiety measures including the MASC, SCARED and ADIS-C/P. Accepted models of child anxiety have often included a higher order global anxiety factor and a number of first order anxiety subtype factors. More recently, bi-factor models have been tested and there is emerging support for those as well. One limitation of the current evidence base is that it fails to recognize the psychometric importance of examining multiple measures and reporters in the same model.

Multitrait-multimethod models.

Campbell and Fiske (1959) introduced the idea of multitrait-multimethod (MTMM) models which allow for the analysis of multiple measures at once. They advocated using multiple methods in assessment in order to separate out method-specific influences along with trait and measurement error. MTMM models permit the investigation of the degree to which method factors affect variance in the measures and/or trait of interest. By using an MTMM model, researchers are able to ensure that a measure reflects the specific trait of interest rather than the general reporting pattern of each informant (Langer et al., 2010).

According to Marsh (1993), analysis of MTMM data usually includes an evaluation of convergent validity for each trait as assessed by different methods or reporters, an assessment of discriminant validity as assessed by a comparison of the correlations between measures of the same and different traits, and an examination of halo effects, the potentially inflated correlations among different traits that are measured by the same method or reporter. To date, very few multiple indicator models for MTMM data have been developed (Eid, Lischetzke, Nussbeck, & Trierweiler, 2003; Marsh, 1993; Marsh & Hocevar, 1988).

The traditional MTMM matrix considers only one scale per trait-method unit but some research has focused on models for multiple indicators per trait-method unit (Eid et al., 2008). Widaman (1985) developed a way to investigate convergent and discriminant validity using nested model comparisons with the hypothesized correlated trait-correlated method model. Lance, Noble & Scullen (2002) offer an informative critique of this method. An application of this method evaluating the construct validity of ADHD and Sluggish Cognitive Tempo (SCT) was recently completed (Leopold, Bryan, Pennington, & Willcutt, 2015). Authors modeled intertrait correlations, measured the validity of the two constructs and also examined method effects by comparing the hypothesized model (Model 1, which allows correlations between traits and methods) to three other models. In this procedure, the subsequent models include Model 2, which omits trait factors and only allows interrater correlations to vary, Model 3, which assigns perfectly correlated traits and still allows interrater correlations to vary, and Model 4, which allows correlations between traits to vary freely and specifies the method factors as uncorrelated. Leopold et al. (2015) concluded that their results supported the existence of correlated but separable ADHD and SCT factors, with parent-ratings explaining more trait variance than self-ratings. Several other detailed discussions of applications of this approach are available (e.g. chapter 10 of the Byrne, 2010 text; Renno & Wood, 2013).

When research involves the use of structurally different methods, as in the case when raters are explicitly selected, Eid et al. (2003) advocate for a correlated trait-correlated (method-1) [CT-C(M-1)] model. In this type of MTMM model, one method is treated as a reference method to which the other methods are explicitly compared and contrasted, allowing for examination of systematic method effects within and across traits. In these analyses, researchers create latent indicator variables by parceling measures or computing the means of selected items that are similar across scales. Koch, Schultze, Burrus, Roberts, & Eid, (2015) report on a series of simulations

showing that when structurally different methods are used along with a CTCM model, a higher proportion of solutions in which at least one method factor became empirically unstable result as compared to those that result from CT-C(M-1) specified models.

One example of the use of the CT-C(M-1) technique was a study conducted in Russia by Grigorenko et al. (2010). These authors used a CT-C(M-1) model to examine five empirically based syndrome traits characterized as internalizing problems as assessed by mother, father, parent and self-reports from the Achenbach System of Empirically Based Assessment, ASEBA (Achenbach & Rescorla, 2001) for 481 Russian youth. Each trait-method combination was represented by two indicators per symptom scale and the four informants. Authors were particularly interested in the degree of trait-specificity of rater biases. The model containing trait-specific method factors and indicator-specific reference factors (mother report) provided a good approximate fit to the data [chi-squared with 440 d.f.=790.73; CFI=.96; RMSEA=.03]. Authors found substantial agreement between parents that was partially shared with teachers, and not shared by the youth themselves. Notably, some self-report indicators did not even load significantly onto the reference factors. Variations in method specificity for the Anxious/Depressed scale led authors to hypothesize that different informants view this trait very differently, almost as different traits.

Another alternative approach is referred to as the correlated uniqueness (CU) model. In contrast to the CTCM model, the CU model does not assume that each method factor is the same for all measures using that method. Instead, each indicator has its own method effect and the covariances between indicators completed by the same rater evaluate the extent to which there is a common method factor (Kenny & Kashy, 1992). In this model, individual method factors are not specified, but all residuals are correlated with one another (Byrne, 2010).

Very few studies related to anxiety measurement have used MTMM methodology with more than one measure and more than one informant. Langer et al. (2010) used the above CFA techniques outlined by Widaman (1985) to test a multitrait-multimethod model examining the construct validity of separation anxiety disorder, social phobia, panic disorder and GAD in a clinical sample of 174 children ages 6 to 17. Using subscales corresponding to the various disorders from the MASC self and parent reports and ADIS: C/P Clinician Severity Ratings, authors showed that the anxiety disorder subtypes demonstrated statistical independence, and fit the data better than a model where the subtypes were not specified. Further, discriminant validity of methods was found, suggesting that each informant/method factor provided distinguishable, unique information. Langer and colleagues concluded that pediatric anxiety is better understood as a composite variable than as a latent variable independent of the methods used to estimate it. They recommended further research efforts to investigate empirically-based approaches to combining informant data.

In summary, the use of CFA techniques in the analysis of MTMM models is a novel methodology that can permit investigation into rater/method biases while appraising the validity of anxiety traits in youth. MTMM data is inherently complicated and there are several modelling approaches that may be considered. According to Marsh & Grayson (1995), as cited in Byrne (2010), "there is, apparently, no 'right' way to analyze MTMM data that works in all situations".

Summary

Anxiety disorders are prevalent in childhood. Pediatric anxiety can interfere with family and peer relationships, school functioning, and physical health. However, cognitive behavior therapy is a very effective treatment for youth with anxiety disorders. For this reason, it is imperative that clinicians have access to accurate ways of assessing anxiety. To date, is has been assumed that more information from more informants necessitates more accurate comprehensive assessments. However, in clinical practice, it is onerous to pay for, administer, and score multiple

interviews and self-report measures for each client. In addition to being potentially cost-prohibitive and quite time-intensive, a lengthy anxiety assessment battery likely feels redundant to clients and could be particularly challenging for families who may have literacy or comprehension challenges. In addition, it is impractical to spend considerable time on assessment prior to initiating treatment.

Although there are currently a number of interview protocols and rating scales with adequate psychometric properties available, informant concordance is so poor across these measures that researchers and clinicians alike continue to use multiple measures and assess multiple perspectives on the child's symptoms. A question in the literature that remains unaddressed is if the diagnostic difficulties and issues of inter-rater disagreement are evidence against the current classification system or if they are a complicating yet distinct issue in an otherwise accurate system. Given the widespread comorbidity of anxiety diagnoses in youth, and the fact that many of these questionnaires were designed to match DSM criteria, there is still debate in the literature about whether the current diagnostic system of anxiety subtypes is valid.

Several of the available anxiety assessment measures have been subject to confirmatory factor analysis in isolation and have revealed factor structures that are mostly consistent with the existence of distinct anxiety subtypes and either a higher-order global anxiety factor or bifactor. One limitation of the current evidence base is that it fails to recognize the psychometric importance of examining multiple measures and reporters in the same model.

Confirmatory Factor Analysis techniques in the analysis of Multitriat Multimethod models can permit investigation into rater/method biases while appraising the validity of anxiety traits in youth. MTMM data is inherently complicated and there are several modelling approaches that may be considered.

The present study will investigate evidence of construct validity for the diagnoses of separation anxiety disorder, social phobia and GAD using the CTCM model. There is clinical

utility in clarifying which indicators in a multi-method, multi-informant approach to anxiety assessment are most informative about latent baseline child anxiety and under what circumstances. An investigation of model invariance by gender and developmental level will provide further recommendations for clinicians and researchers in different contexts. This study seeks to confirm and extend the findings of Langer et al. (2010) by including additional indicators for each method factor. Whereas Langer et al. (2010) had a sample of 174 children and included only the MASC and the ADIS in their model, the present study uses a larger clinical sample and also includes the SCARED and PARS.

CHAPTER 3: METHOD

Participants

Participants were drawn from two de-identified data sets. Eighty-five percent of the sample was taken from the Child and Adolescent Anxiety Multimodal Study (CAMS; Walkup et al., 2008). The remaining 15% came from the Childhood Anxiety Treatment Enhancement Study (CATES) based on CAMS procedures (Stark, Banneyer, Wang, & Kendall, in progress). All data were for clinical participants. Assessment measures were completed at baseline, prior to the initiation of treatment.

The total sample was comprised of 572 children (51% male) and parent dyads presenting for treatment for clinical levels of youth anxiety. Approximately 80% of parent reporters were mothers, 10% were fathers, and the remaining 10% were grandparents or other adult caregivers living in the home. Child participants were males and females between the ages of 6.11 and 17.11 who met criteria for primary diagnoses of generalized anxiety disorder (GAD), separation anxiety disorder, and/or social phobia (social anxiety disorder) based on the ADIS-IV C/P semi-structured diagnostic interview. The majority of participants (78%) received primary diagnoses of two or more anxiety disorders. A portion of the sample also had secondary diagnoses of co-existing disorders including other anxiety disorders (e.g. panic disorder or obsessive-compulsive disorder) or dysthymia (38%), ADHD (14%), Oppositional-defiant disorder or conduct disorder (10%) and tic disorder (3%).

Children were excluded from the studies if they had an IQ score below 80, could not speak or read English, or had any of the following comorbid diagnoses: major depressive disorder, bipolar disorder, psychotic disorder, pervasive developmental disorder, eating disorders, substance use disorders, or severe attention-deficit/hyperactivity disorder that was not well controlled.

Various racial and ethnic backgrounds were represented in the clinical sample, including Caucasian, African American, Hispanic, and Asian. Children in the sample were predominantly Caucasian (66%) and from middle-class or upper middle class backgrounds.

Fifty-five percent of the sample represented middle childhood (ages 6.11 to 10.11) and the remainder represented adolescence (ages 11.0-17.11). Demographic and diagnostic information for both the whole sample and the middle childhood subsample are presented in Table 3.1 on the next page.

Children from the CAMS study were recruited between December 2002 and May 2007 at one of the following sites: Duke University Medical Center, New York State Psychiatric Institute–Columbia University Medical Center–New York University, Johns Hopkins Medical Institutions, Temple University, University of California, Los Angeles, and Western Psychiatric Institute and Clinic–University of Pittsburgh Medical. Data from CAMS were obtained from the limited access dataset distributed from the NIH-supported "Child and Adolescent Anxiety Disorders" (CAMS, Data Version 1). Child participants from the CATES study were recruited between August 2012 and April 2017 at the Texas Child Study Center in Austin, Texas.

Table 3.1.
Sample Characteristics

Characteristic	Whole Sample (*N*=572)		Middle Childhood Subsample (*N*=314)	
Sex	%	N	%	N
Male	51.4%	294	49.6%	156
Female	48.6%	278	50.4%	158
Age				
6.11- 7.11	58	10.1%	58	18.5%
8.0- 8.11	88	15.4%	88	28%
9.0-9.11	94	16.4%	94	30%
10.0-10.11	74	13%	74	24%
11.0-11.11	63	11%	-	-
12.0-12.11	53	9.2%	-	-
13.0-13.11	41	7.2%	-	-
14.0-14.11	29	5%	-	-
15.0-15.11	26	5%	-	-
16.0-16.11	30	5.2%	-	-
17.0-17.11	16	3%	-	-
Race/Ethnicity				
Caucasian	380	66.4%	216	68.8%
Hispanic	76	13.3%	41	13%
African American	46	8%	19	6%
Asian	12	2%	7	2.3%
Native Hawaiian/ Other Pacific Islander	2	< 1%	1	< 1%
American Indian	6	1%	2	< 1%
Other	50	8.7%	28	8.9%
Diagnoses				
Separation Anxiety	295	51.6%	206	65.6%
Social Phobia	455	79.5%	235	74.8%
Generalized Anxiety Disorder	457	79.9%	251	79.9%
Comorbid (two or more)	445	77.8%	250	79.6%

Measures

ADIS- C/P: Clinician Severity Rating (CSR). The Anxiety Diagnostic Interview Schedule for DSM-IV: Child and Parent versions (ADIS-C/P; Silverman & Albano, 1996) is a widely used semi-structured interview with good psychometric properties. According to Banneyer (2015) the ADIS-C/P was used to determine the presence of anxiety disorder in 25 intervention studies between 1996 and 2013. The ADIS-C/P showed excellent test-retest reliability in a sample of 62 children presenting to an anxiety disorders specialty clinic (inter-class correlation coefficients ranged from 0.78-0.87 for child interviews and 0.81-0.89 for parent interviews; Pearson correlation coefficients for consistency of clinician severity ratings from time 1 to time 2 ranged from 0.80-0.84) (Silverman et al., 2001). The ADIS-C/P has also demonstrated high inter-rater reliability (kappa=.92 for principal diagnosis; (Lyneham, Abbott, & Rapee, 2007)). The ADIS-C/P has also demonstrated convergent validity with other measures of anxiety including the SCARED and the MASC (Wood, Piacentini, Bergman, McCracken, & Barrios, 2002).

The ADIS C/P assesses diagnostic criteria for anxiety disorders according to the DSM-IV and also evaluates mood and externalizing disorders. Clinicians make Clinician Severity Ratings (CSR: 0= not at all, 4= some, 8 = very, very much) for each assigned diagnosis. The CSR for GAD, separation anxiety disorder and social phobia (social anxiety disorder) were used as indicators in the present study. Because of the scale of the CSR ratings, for the purposes of CFA analysis, the ADIS was considered to be an ordinal variable.

PARS: total score (clinician rated). The Pediatric Anxiety Rating Scale (PARS; RUPP, 2002) is a 50-item anxiety symptom checklist that assesses frequency, severity and associated impairment of separation anxiety, social phobia and GAD symptoms in children ages 6-17 (RUPP 2002). The PARS provides information over and above the ADIS-C/P because it yields a

global impairment score that takes into account comorbidity among anxiety disorders. The PARS has been used as the primary outcome measure in at least eight clinical trials as of 2011 (Ginsburg et al., 2011). It has excellent interrater reliability (ICC=0.97), adequate test-retest reliability (coefficient =0.55) and fair internal consistency (Cronbach's alpha = 0.64 in a clinically anxious sample and 0.75 in an at-risk sample) as reported by RUPP (2002).

The PARS was designed to be completed by a clinician interviewing the child along with his or her parent. It is the only clinician-rated instrument that assesses global anxiety severity and impairment across disorders. In order to compute a score, the clinician determines presence or absence of each symptom during the past week and then collectively rates the child's symptoms globally. The global severity ratings are determined based on a 6-point scale (0=none, 1=minimal, 5=extreme). Then, ratings for the five dimensions result in a total score. The dimensions are: frequency of symptoms (none to several hours per day), severity of associated distress, avoidance, interference at home, and interference outside the home. In the present study, the PARS was considered an indicator of the clinician method factor. As a global severity score, it was not specified to load on any of the specific trait factors.

MASC: parent report and child self-report. The Multidimensional Anxiety Scale for Children (MASC; March et al., 1997) is a 39-item informant-report measure of anxiety symptoms scored on a four-point scale (0=never true, 1=rarely true, 2=sometimes true, 3=always true). The MASC has four factors, three of which can be subdivided: physical symptoms (tense/restless and somatic/autonomic), social anxiety (humiliation/rejection and public performance fears), separation/panic, and harm avoidance (divided into the sub-factors of perfectionism and anxious coping). The factor structure of the MASC is invariant across gender and age, and it shows excellent internal reliability (March et al., 1997). According to the authors,

the factor structure matches the DSM-IV diagnostic clusters of social phobia, separation anxiety, and, averaged across all factors, the total score is representative of GAD.

For the present study, the social anxiety indicators were comprised of the raw scores for the nine items that are said to load on that factor (for parents and children separately). The separation anxiety indicators (parent and child) were comprised of the raw scores for the nine items said to load on that factor. For the Generalized Anxiety indicator, however, rather than use the total MASC scores, which subsume the items for the other indicators, the items contributing to the physical symptoms (12 items) and harm avoidance (nine items representative of perfectionism/anxious coping) factors were used. Preliminary analyses showed that an indicator comprised of these items showed stronger correlations with other measures of GAD than an indicator comprised of the MASC total score. Previous researchers have used the Harm Avoidance Scale alone as an indicator of GAD (Langer et al., 2010). However, since GAD involves both physical (somatic) symptoms and perfectionism/anxious coping, the decision to use both of these scales was both theoretically and statistically acceptable.

The researcher computed the scale scores for the MASC in accordance with the directions in the technical manual (March, 1997). When a few individual items contributing to a scale were skipped, or left missing, they were scored as "0". This underestimation was later compensated for by multiplying the obtained raw score by the total number of items on the scale and then dividing by the total number of items that had responses. When more than a few items were missing, such as was the case for 12 participants who only completed the front of the measure, the entire measure (all subscales) were coded as missing.

SCARED: parent report and child self-report. The Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997) is a 41-item self-report measure of anxiety symptom frequency and intensity measured on a three-point scale (0-2). It has five

subscales that align with DSM-IV anxiety diagnoses (panic/somatic, generalized anxiety, social anxiety, separation anxiety, and school phobia) and also produces a total score of anxiety level. Internal and test–retest reliabilities vary from moderate to excellent for the total scale and subscales. The overall low inter-informant agreement, or concordance, for parent and child was better with adolescents than with children. The SCARED correlates well with both the MASC and RCMAS. In the present analysis, the generalized anxiety (nine items), social phobia (seven items), and separation anxiety (eight items) subscales were used as indicators. The researcher computed the subscale scores from raw scores on each item. If an item contributing to a particular scale was missing, the researcher substituted the mean score for that scale as recommended by the authors.

Procedures

Participants in both CAMS and CATES were recruited to receive a free anxiety intervention for youth who met criteria for a clinical diagnosis of one of the big three anxiety disorders. All measures for the present study were completed after a parent or guardian completed a phone-screen to determine if the child seemed to be a good candidate for an anxiety evaluation. For CAMS, the telephone screening procedure was semi-scripted and designed to elicit preliminary inclusion/exclusion information and to provide additional information to the caller. For CATES, the phone screen consisted of asking a series of questions about physical, mental health, and educational history, and completing a pre-baseline SCARED questionnaire. If no disqualifying information was discovered, and any elevation was noted on the SCARED, the child and parent were invited to complete a diagnostic interview.

At the first in-person clinic visit, informed consent for the diagnostic interview process was obtained, and the ADIS-C/P was administered by independent evaluators (IEs) who had undergone a rigorous training and certification process. For the CAMS study, this was a formalized process

and Quality Assurance for the IEs was monitored by the New York State Psychiatric Institute. Within CATES, the ADIS interviews were administered by graduate students who had completed training and received both live and video-recorded supervision. Multiple interviewers were used for the separate parent and child ADIS interviews. After each interview, graduate students who administered the parent and child ADIS met together with their clinical supervisor to determine the Clinician Severity Ratings for each diagnostic condition.

Next, for both samples, families who were admitted into the studies were invited to return to the clinic to complete the PARS interview together between 5 and 28 days later. In the CAMS study, participants and their caregivers also completed the MASC and SCARED questionnaires at this visit. For the CATES study, participants were given the option to complete the questionnaires in person after the PARS, or to complete them at home and mail or return them in person within one week (It is this second SCARED-P that is included in the model, and not the initial phone screen SCARED, because it was measured at the same time point as the other parent and child report measures, and because there is no benefit for parents to over-report symptoms. On the first administration, during the screening, well-meaning parents may have knowingly or unknowingly over-reported symptoms in an effort to ensure their child was admitted into the treatment study).

At the next visit, the "orientation", consent and assent was obtained again. Participants from both groups were also informed which treatment condition they had been randomized into (CBT, Medication only, CBT + Medication, or Placebo Pill for CAMS, and CBT or CBT + Parent Coaching for CATES).

Ethical considerations. The research protocols for the intervention studies were approved and monitored by institutional review boards (IRBs) at each CAMS center and the University of Texas at Austin. The National Institute of Mental Health safety monitoring board also ensured adherence to ethical standards for CAMS. In both studies, prior to the start of the

clinical intake assessment, at least one parent provided informed consent and youth provided assent to have their data used for research purposes. The current study did not require additional IRB approval since both clinical projects received approval, and this study involved only de-identified data that had already been collected.

Data storage. Data obtained for this project were kept secure and appropriately protected. The Category I digital data from CAMS was protected by the University of Texas at Austin Office of Sponsored Projects Sensitive Data Control Plan (SDCP) certification guidelines. The dissertation advisor retained control over the data and, subject to applicable law, did not distribute the raw data in any form to any entity or individual other than authorized research staff who agreed to the terms of the Data Use Certification (DUC). The CATES data is secured in multiple de-identified, password protected folders on UT Box.

Statistical analyses

The current study examined self, parent and clinician reports about baseline youth anxiety in a clinical sample. First, the researcher investigated overall patterns in means and the magnitude of mean differences across indicators for males vs. females and younger vs. adolescent participants. Next, the researcher investigated the correlation matrix for the whole sample, in order to assess interrater agreement among all indicators. It was hypothesized that findings for this sample would match what has been shown in the literature. Namely, girls would report more anxiety than boys, younger children would display more separation anxiety, older children would display more social phobia, and generalized anxiety would remain relatively stable across age groups. It was also hypothesized that parent-child concordance rates would match previous findings, with r's in the .40 range.

Next, through the primary analysis, the construct validity of separation anxiety, social phobia, and generalized anxiety was examined at the matrix-level and indicator-level in order to

answer Research Question 1: Should youth anxiety be conceptualized as one general factor, three separate anxiety traits, or something else? It was hypothesized that youth anxiety would be conceptualized as separate traits, in line with the DSM V.

Convergent and discriminant validity were assessed using confirmatory factor analytic (CFA) techniques to test a multitrait-multimethod (MTMM) model. The CFA approach to MTMM is preferred because it treats the trait and method factors as latent variables and evaluates convergent and discriminant validity at the model level (Renno & Wood, 2013). Discriminant validity is found when the assessment methods diverge in their measurement of different traits while convergent validity is found when different methods agree in their measurement of the same traits. The hypothesized MTMM model is compared with a nested series of more restrictive models in which specific parameters are either eliminated or constrained equal to zero or one (Widaman, 1985; Byrne, 2010).

The first model investigated in the present study was an MTMM general CFA model with correlated traits and correlated methods (see Figure 3.1). The trait factors (big three anxiety diagnoses) and method factors (clinician, child or parent report) were estimated and modeled as latent variables based on the observed indicators included in the model. This first model is least restrictive because both trait and method factors were allowed to freely correlate.

Next, Model 2 omitted trait factors all together, and allowed correlation between method factors (Figure 3.2). Convergent validity was examined by comparing Model 1 to Model 2. Model 3 was estimated with perfectly correlated traits and free correlation between method factors (Figure 3.3). Discriminant validity of the traits was assessed by comparing Model 1 to Model 3. Finally, Model 4 was estimated with freely correlated traits and methods that were specified to be uncorrelated. The researcher investigated the presence or absence of method effects (due to

systematic differences in how raters conceptualize the child's anxiety) by comparing Model 4 to the initial model (Figure 3.4).

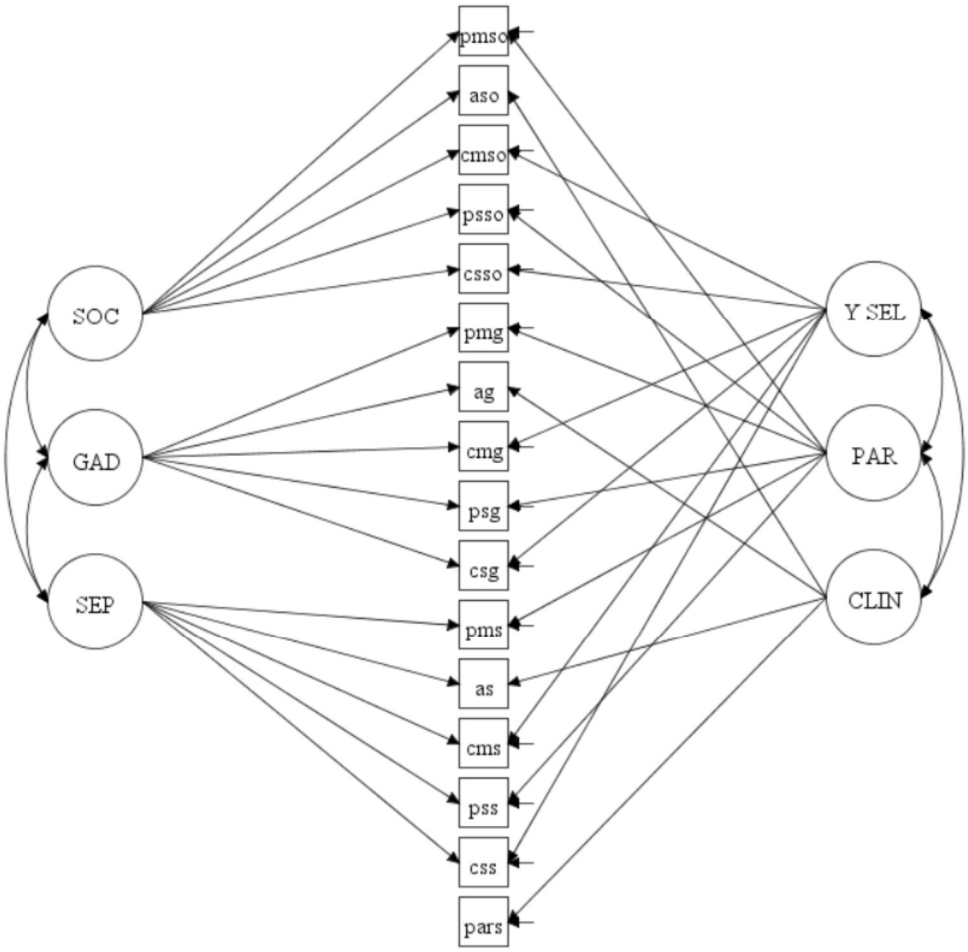

Figure 3.1
Correlated trait/ correlated method (CTCM) MTMM Model

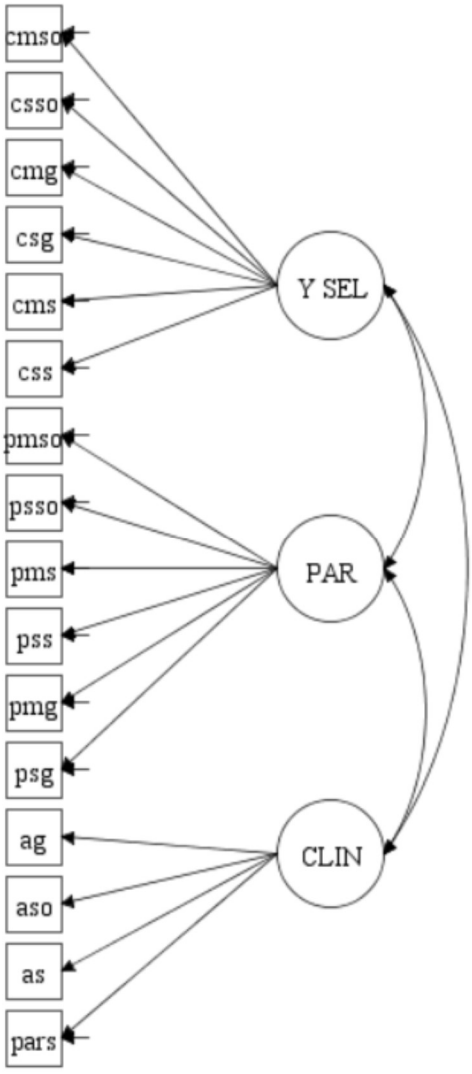

Figure 3.2
No traits/ correlated methods (NTCM) MTMM Model

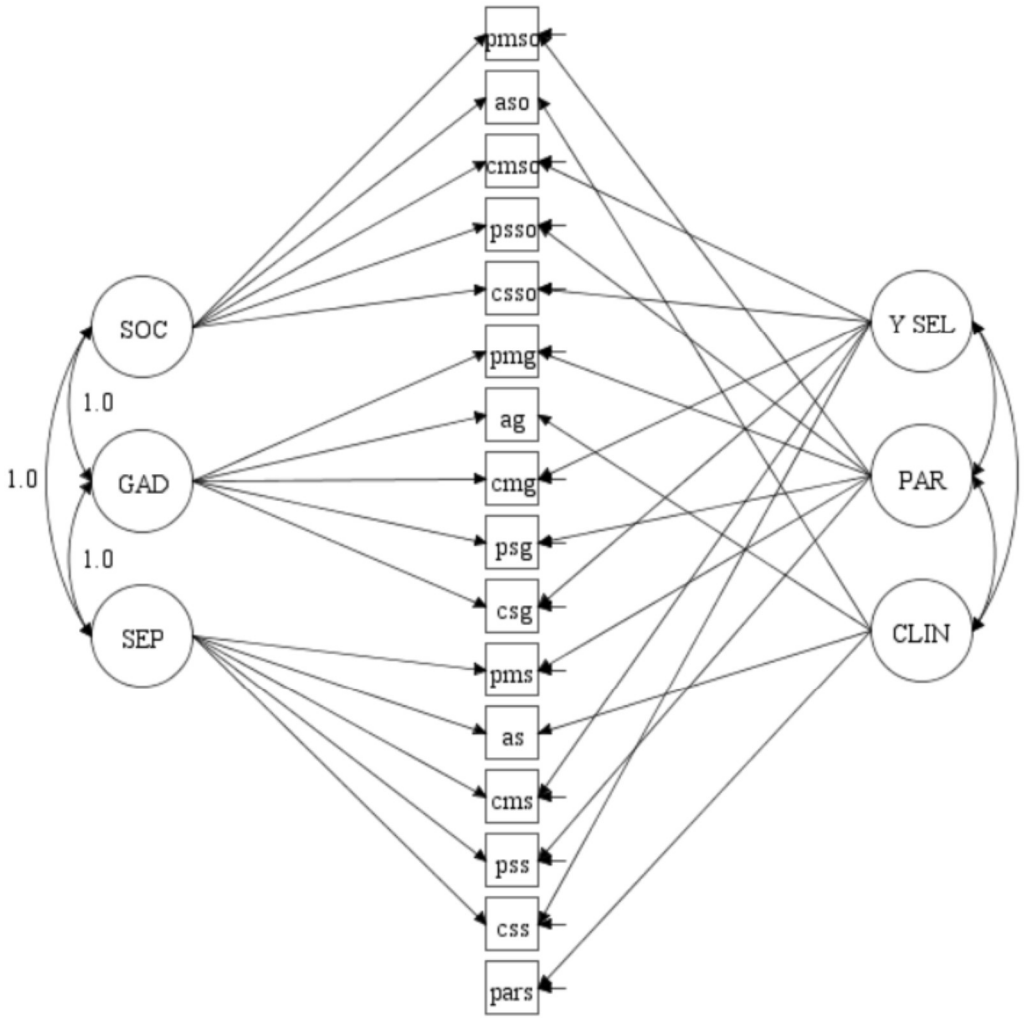

Figure 3.3
Perfectly correlated traits/ correlated methods (PCTCM) MTMM Model

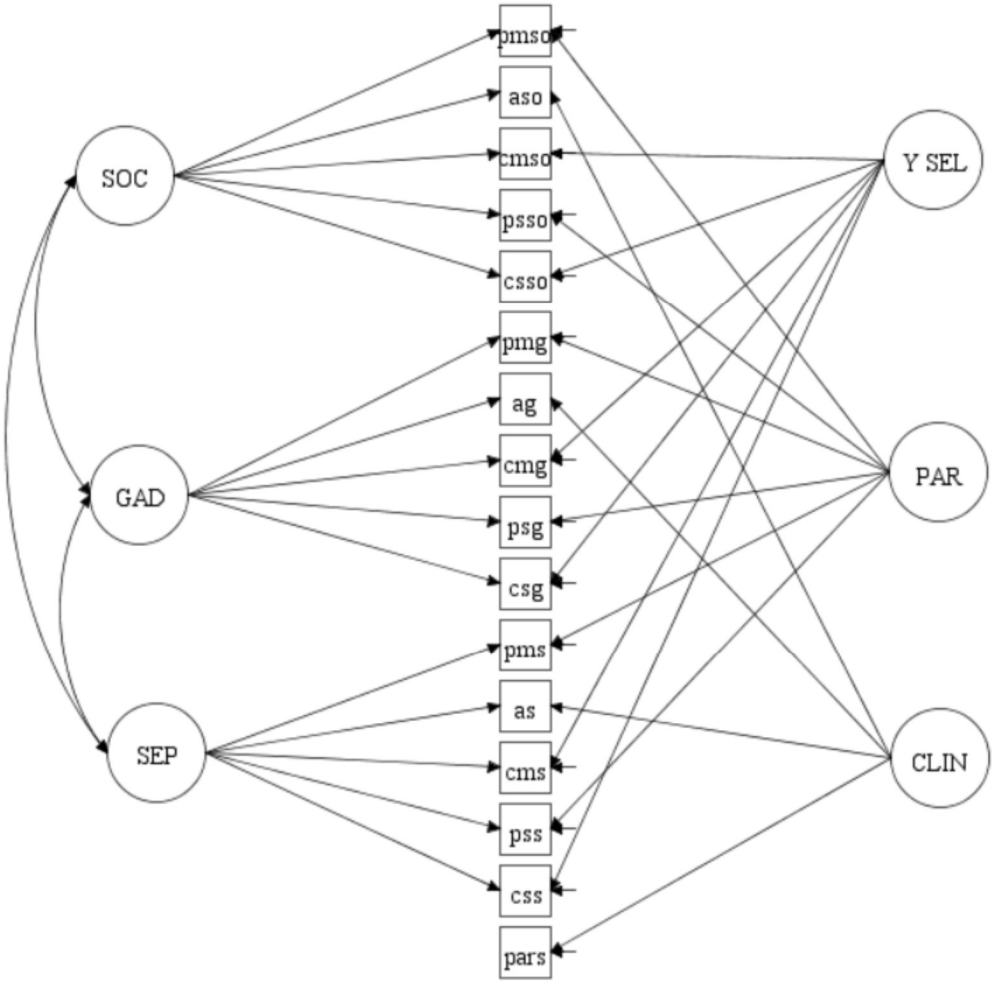

Figure 3.4
Correlated traits/uncorrelated methods (CTUM) MTMM Model

All models were estimated using MPlus version 7. Because of concerns about normality and the use of ordinal data (ADIS CSR scores), CFA was conducted using Weighted Least Squares Means and Variance Adjusted (WLSMV) as the estimator, as recommended by Li (2016). WLSMV is a robust method of estimation where the optimal weight matrix is replaced by a

diagonal matrix. According to the MPlus authors, WLSMV has performed well in the context of simple structure CFA models, in preliminary simulation studies, and estimation research, but more studies are needed to further establish the usefulness of the estimator in various circumstances (Brown, 2015). Nussbeck, Eid, & Lischetzke (2006) conducted a complex simulation study based on an empirical application of the CT-C(M-1) model of MTMM data with the WLSMV estimator. They concluded that the WLSMV estimator provides a slightly liberal but acceptable approximation of the chi-squared distribution with a sample size of 500. For a discussion of new potential alternatives to WLSMV for estimation of MTMM models with categorical data, see Jeon & Rijmen (2014).

For each model, both incremental and absolute fit indices were estimated. The Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA) with 90% Confidence Interval were examined as estimates of goodness-of-fit. Values of the CFI and TLI higher than .90 represent an acceptable fit, and higher than .95 represent a good fit. Values of the RMSEA lower than .08 represent an acceptable fit, and lower than .05 represent a good fit (Hu & Bentler, 1999).

Due to the use of the WLSMV estimator, degradation or improvement across nested models could not be compared by examining $\Delta\chi 2$ in the traditional manner. Instead, the DIFFTEST option for comparison of nested models was computed in MPlus. Using DIFFTEST, the least restrictive model is fit first and significant p-values suggest the restriction worsens model fit (Muthen & Muthen, 2017). Once the best fitting model was identified, the next two Research Questions were answered: RQ 2: Do the different raters provide redundant information or add unique elements to the conceptualization of a child's anxiety? Which informants provide the most accurate information about a clinically anxious child's latent baseline level of anxiety? RQ3: In

the best fitting model, which specific measures have the highest factor loadings for each trait factor?

Finally, multigroup factorial invariance (MFI) analyses was conducted using model constraints following the example of White et al., (2015). This analyses provided an answer the last Research Question: Are there significant differences in indicator means and overall model fit by gender? This gender analysis was completed for the whole sample rather than the middle childhood subsample. After examining gender differences in the same model, the researcher also examined overall model fit for all females and all males in the sample separately.

CHAPTER 4: RESULTS

Preliminary Analyses

Missing Cases. There were few missing data points in the dataset, and those that were missing were deemed to be Missing At Random. Out of the total sample of 572 participants, there were between 2 (ADIS) and 22 (MASC-C-GAD) missing cases across indicators, with an average of 7.3 missing cases per indicator. See Table 4.1 for complete information about missing cases. A table of covariance coverage computed by MPlus indicated that the pair of measures with the most missing data was the child and parent MASC for GAD (6.7% missing data). Aside from pairings involving these measures, 96% or more of the data was present for all other combinations of pairs of measures. Missing data was estimated automatically through the use of the WLSMV estimator. For a thorough discussion of this procedure, see Asparouhouv & Muthén (2010).

Table 4.1:
Missing Cases

Indicator	Number of Missing Cases
ADIS (GAD & SOC)	2
ADIS- SEP	3
PARS	6
MASC-P -GAD	18
MASC-P (SOC & SEP)	4
SCARED-P (GAD, SOC & SEP)	5
MASC-C-GAD	22
MASC-C (SOC & SEP)	7
SCARED-C (GAD, SOC & SEP)	9

Differences in Means. Independent samples t-tests of the means of each measure were conducted by developmental level and gender in order to examine general trends and provide evidence for or against separating the data into subsamples for the present analysis.

Results showed that the adolescent group had significantly higher means on the measure of global anxiety severity (PARS) and five indicators of social phobia. The adolescent group also demonstrated significantly higher mean scores for the SCARED self-report of symptoms of GAD. Further, results showed that the middle childhood group had significantly higher mean scores for all five indicators of separation anxiety. These results are presented in Table 4.2.

In comparing males to females in the sample, the following results were obtained. Girls in the sample rated themselves as having higher anxiety than boys for both social phobia self-report subscales as well as the separation subscale of the MASC and the GAD subscale of the SCARED. Parents of girls rated their daughters as having significantly higher means than boys for the separation anxiety subscale of the MASC, the social phobia subscale of the SCARED and the two subscales comprising the GAD indicator for the MASC. As discussed in more detail in the next section, daughter and parent reports were more concordant than son and parent reports across rating scales in all areas. Results for this analysis are presented in Table 4.3.

Table 4.2.
Descriptives with T-Test by Developmental Level

		Middle Childhood (N=314)		Adolescents (N=258)		Independent Samples Test		
Measure	Subtest	Mean	SD	Mean	SD	*t*	*df*	*P*
ADIS	Separation	3.86	.012	2.12	.008	8.67	567	.00*
	Social Phobia	4.14	.013	4.86	.019	-4.27	568	.000*
	Generalized	4.61	.015	4.62	.018	-.03	568	.974
MASC-P	Separation	16.47	5.34	11.93	6.44	9.17	566	.000*
	Social Phobia	17.37	6.43	18.78	6.01	-2.63	566	.009*
	Generalized	30.14	8.55	30.78	8.73	-.86	552	.392
MASC-C	Separation	11.33	5.76	7.58	5.48	7.87	563	.000*
	Social Phobia	9.05	6.81	13.46	7.71	-7.20	563	.000*
	Generalized	31.94	9.30	31.29	10.07	.786	548	.432
Scared-P	Separation	7.22	4.08	4.63	3.97	7.62	565	.000*
	Social Phobia	8.21	4.06	8.91	4.27	-1.99	656	.048*
	Generalized	9.43	4.06	10.00	4.18	-1.65	565	.100
Scared-C	Separation	5.58	4.18	3.32	3.23	7.04	561	.000*
	Social Phobia	5.92	3.91	6.98	4.53	-2.99	561	.003*
	Generalized	5.04	4.19	8.20	5.05	-8.10	561	.000*
PARS	Global	18.90	4.40	19.66	4.23	-2.09	564	.037*

Table 4.3.
Descriptives with T-Test by Gender

		Females (N=278)		Males (N=294)		Independent Samples Test		
Measure	Subtest	Mean	SD	Mean	SD	*t*	*df*	*P*
ADIS	Separation	3.22	2.54	2.94	2.53	1.33	567	.185
	Social Phobia	4.56	1.98	4.38	2.01	1.07	568	.287
	Generalized	4.63	1.90	4.60	1.91	.151	568	.880
MASC-P	Separation	15.11	5.88	13.76	6.61	2.56	566	.011*
	Social Phobia	18.36	6.32	17.70	6.33	1.24	566	.217
	Generalized	31.30	8.51	29.62	8.70	2.29	552	.022*
MASC-C	Separation	10.31	6.01	8.96	5.81	2.72	563	.007*
	Social Phobia	12.08	7.60	10.09	7.43	3.15	563	.002*
	Generalized	32.05	9.40	31.25	9.94	.966	548	.334
Scared-P	Separation	5.98	4.08	6.13	4.38	-.427	565	.670
	Social Phobia	9.00	4.00	8.08	4.30	2.66	565	.008*
	Generalized	9.79	4.20	9.59	4.08	.565	565	.527
Scared-C	Separation	4.81	3.92	4.30	3.97	1.56	561	.119
	Social Phobia	6.92	4.40	5.90	4.06	2.88	561	.004*
	Generalized	7.09	4.82	5.90	4.85	2.93	561	.004*
PARS	Global	19.49	4.20	19.01	4.46	1.32	564	.186

Based on observed trends and distinct differences in the overall pattern of anxiety symptoms by developmental level, the investigator determined it was likely that latent anxiety for the middle childhood subsample was distinct from the adolescent subsample. However, due to a less clear division by gender, and a hypothesis that potentially strong gender differences might not emerge until adolescence, it was determined that girls and boys in the younger subsample should be initially included in the same analyses.

Correlations. Next, correlations among all indicators in the model were examined for the full sample. Reporters' ratings of the three anxiety traits are related to each other in a pattern that supports their construct validity. Convergent validity is supported because ratings are significantly correlated within each disorder across informants. For example, the clinician-rated ADIS score for separation anxiety correlated moderately with the parent report scores for separation anxiety on both the SCARED-P (0.627) and MASC-P (0.654), as well as the child report scores for the separation subscale (SCARED-C=0.428, MASC-C=0.415). Similarly, the clinician-rated ADIS score for social phobia correlated moderately with the parent report scores for the social phobia subscales on both the SCARED-P (0.604) and the MASC-P (0.587) as well as the child report scores (SCARED-C=0.382, MASC-C=0.412). Correlations between the ADIS score for GAD and the parent and self-report scores on the other measures were weaker but still significant.

When one measure was completed by two different informants, correlations were weak to moderate, and generally in-line with or higher than typically found in the literature. For the MASC, child and parent concordance was 0.582 for separation anxiety, 0.446 for social phobia, and 0.265 for GAD. For the SCARED, child and parent

concordance was 0.517 for separation anxiety, 0.449 for social phobia and 0.383 for GAD. In general, adolescent reports and reports of anxious girls were more highly correlated with parent reports than those of boys and younger participants in the middle childhood age range. Parent and child concordance by subsample is reported in Table 4.4.

Table 4.4
Parent & Child Concordance by Age and Gender

	Middle Childhood	Adolescents	Boys	Girls
Separation MASC/ SCARED	0.422 / 0.393	0.646 / 0.601	0.547/0.483	0.614/0.562
Social MASC/ SCARED	0.340/0.351	0.545/0.537	0.396/0.423	0.492/0.462
GAD MASC/ SCARED	0.260/0.314	0.274/0.451	0.204/0.370	0.327/0.395

Surprisingly, most indicators in the model, including the ADIS, correlated weakly with the PARS (ranging from 0.138 to 0.321). Examining other correlations among indicators completed by the same informant produced expected results and moderate to strong correlations. For example, the two parent report measures of separation anxiety had a correlation of 0.785 and the two child report measures of social phobia had a correlation of 0.682.

Evidence of discriminant validity was partially supported. In general, ratings of distinct traits were not significantly correlated with one another across different informants. However, there were a few exceptions. The child report for social phobia on

both the MASC and SCARED and the ADIS for social phobia were all weakly but significantly correlated with the parent report for GAD on the SCARED (0.319, 0.208, and 0.206). This is not entirely surprising since GAD often encompasses some lower-level social worries. In addition, the child report for separation anxiety on the MASC was significantly correlated with the parent report for GAD on the MASC. Again, this is unsurprising; especially in younger children, GAD often involves worries with an attachment theme. Overall, the correlational data suggested moderate evidence of convergent and discriminant validity for social phobia and separation anxiety, and less evidence for GAD. The construct of GAD may be harder to differentiate because it often involves lower level worries similar to those held by children who meet diagnostic criteria for social phobia and separation anxiety. Table 4.5 depicts the correlations between all the indicators in the model for the full sample.

Table 4.5

Correlations between Model Indicators

	PARS	ADIS S	ADIS SO	ADIS G	PMS	PMSO	PMG	PSS	PSSO	PSG	CMS	CMSO	CMG	CSS	CSSO
PARS	1.0														
ADIS S	0.239**	1.0													
ADIS SO	0.283**	-0.064	1.0												
ADIS G	0.224**	0.037	0.084	1.0											
PMS	0.237**	0.654**	-0.092	0.100*	1.0										
PMSO	0.268**	-0.085	0.587**	0.082	0.100*	1.0									
PMG	0.270**	0.183**	0.026	0.234**	0.287**	0.175**	1.0								
PSS	0.255**	0.627**	-0.126*	0.106**	0.785**	0.064	0.278**	1.0							
PSSO	0.289**	0.054	0.604**	-0.106**	0.139**	0.660**	0.140**	0.109**	1.0						
PSG	0.321**	-0.061	0.206**	0.369**	0.158**	0.524**	0.411**	0.246**	0.293**	1.0					
CMS	0.172**	0.429**	-0.153**	0.089	0.582**	-0.033	0.207**	0.507**	0.003	0.121**	1.0				
CMSO	0.216**	-0.201**	0.412**	0.063	-0.115**	0.446**	0.108*	-0.110**	0.332**	0.319**	0.232**	1.0			
CMG	0.138**	0.087*	0.100*	0.217**	0.113**	0.147**	0.265**	0.137**	0.042	0.257**	0.331**	0.403**	1.0		
CSS	0.193**	0.428**	-0.144**	0.107*	0.465**	-0.041	0.137**	0.517**	-0.001	0.073	0.743**	0.240**	0.342**	1.0	
CSSO	0.205**	-0.049	0.382**	0.005	0.024	0.358**	0.101*	0.003	0.449**	0.208**	0.321**	0.682**	0.330**	0.381**	1.0
CSG	0.256**	-0.149**	0.150**	0.272**	-0.093*	0.194**	0.239**	-0.044	0.076	0.383**	0.212**	0.713**	0.435**	0.318**	0.508**

** $p<.05$; ** $p<.01$*

Primary Analyses

The unconstrained MTMM model was tested first. When parameters are freely estimated, the researcher allows the analysis to find the values for the parameters in the CFA solution (e.g., factor loadings, factor correlations, unique variances) that optimally reproduce the variances and covariance of the input matrix (Brown, 2015). Results from the initial confirmatory factor analysis conducted with all 572 participants showed that model estimation terminated normally, but the estimated covariance matrix for the latent variables produced negative values for the covariance between the trait factors. In addition, the sample fit the hypothesized model adequately, but not as well as expected (RMSEA=.078, CFI=0.841, TLI=.770). Modification Indices were examined, but there was no theoretical precedent to justify modifying the model based on the post-hoc suggestions of the modelling program.

Given the observed differences in means and diagnostic patterns for the middle childhood and adolescent subsamples, the researcher subsequently tested the initial model using just the middle childhood subsample. It was hypothesized that the MTMM model might fit the younger sample better, since it contained a more even distribution of diagnoses (more separation anxiety) and less concordance among raters.

CFA results for the unconstrained estimation of the middle childhood sample also terminated normally, but the residual variance for the PARS was estimated to be negative. According to Byrne (2010), this is not at all uncommon in MTMM models, and offending parameters may be expected based on the complexity of model specification. One approach for finding a better-fitting solution is to simply remove the problematic indicator (Brown, 2015). Another way to resolve this improper outcome is to fix the

parameter to a value of zero (Byrne, 2010). However, in this particular case doing so would result in a solution that overestimates the contribution of the PARS to the clinician method factor at the expense of the ADIS indicators. The researcher fixed the PARS residual to a value of 0.6, (which was calculated to be the square root of one minus the published reliability; √(1-0.64)) in order to more accurately estimate the model.

This time, better fit was obtained (RMSEA=.059, CFI=0.904, TLI=0.861). The researcher used the middle childhood subsample and the fixed PARS parameter for the remainder of the MTMM analyses. Goodness-of-fit indices for each of the nested models are displayed in Table 4.6. The chi-square test of model fit measures the degree to which the data depart from the specified model. The larger the chi-square relative to the degrees of freedom, the poorer the model fit. Additional indicators of fit include RMSEA, CFI and TLI. Once again, acceptable fit is suggested by RMSEA values less than .08 and CFI/TLI values above 0.90.

In addition to examining overall fit for each of the models, it is important to compare the fit indices between models. Table 4.7 includes differences in chi-square, CFI and TLI values, degrees of freedom and p-values for each of the nested models as compared to Model 1. These values were computed using DIFFTEST in MPlus.

Table 4.6
Summary of Goodness-of-fit Statistics for General Confirmatory Factor Analysis (CFA) Multitrait-Multimethod (MTMM) models with the Middle Childhood Subsample

Model	χ^2	*df*	RMSEA	CFI	TLI
1 Freely correlated traits; Freely correlated methods	171.21	84	.057	.908	.868
2 No traits; Freely correlated methods	625.72	102	.128	.445	.348
3 Perfectly correlated traits; Freely correlated methods	354.94	87	.099	.716	.609
4 Freely correlated traits; Uncorrelated methods	355.69	87	.099	.716	.608

Table 4.7
Differential Goodness-of-fit Statistics for MTMM nested model comparisons

Model comparisons	$\Delta\chi^2$	Δdf	*p*	Δ CFI	Δ TLI
Test of convergent validity					
Model 1 vs. Model 2 (traits)	338.95	18	<.0001	.46	.52
Tests of discriminant validity					
Model 1 vs. Model 3 (traits)	96.32	3	<.0001	.19	.26
Model 1 vs. Model 4 (methods)	73.72	3	<.0001	.19	.26

The first comparison provides evidence for convergent validity because the inclusion of traits in the first model (Figure 4.1) significantly improves the fit as compared to the second model with no traits (Figure 4.2).

The second comparison supports discriminant validity of trait effects because a model where the traits correlated freely (Figure 4.1) fit better than one where all the traits were constrained to be perfectly correlated (Figure 4.3). The larger the discrepancy between the $\chi 2$ and CFI values, the stronger the support for evidence of discriminant validity (Byrne, 2010). This result suggests meaningful divergence in the data by trait.

Finally, presence of method effects was also supported. Model fit improved when methods were allowed to correlate freely (Figure 4.1) as compared to when they were specified to be uncorrelated (Figure 4.4). This suggests that for younger children, child report, parent report, and clinician rating provide unique information about each of the three traits measured in the present analysis.

The initial CTCM model (Figure 4.1), was determined to be the best fitting model. It included moderate to strong factor loadings which are discussed next. For the Separation Anxiety and Social Phobia factors, the highest factor loadings resulted from the ADIS CSR, and the two parent report measures. For the GAD factor, the parent report for the SCARED subscale of GAD had the strongest factor loading, followed by the ADIS CSR. In terms of method factors, all of the child indicators had strong loadings on the child report method factor. Parent report measures showed moderate to strong loadings. The weakest factor loadings were seen on the clinician method factor. Table 4.8 reports the standardized estimates of trait and method loadings for this CTCM model. All trait loadings are statistically significant.

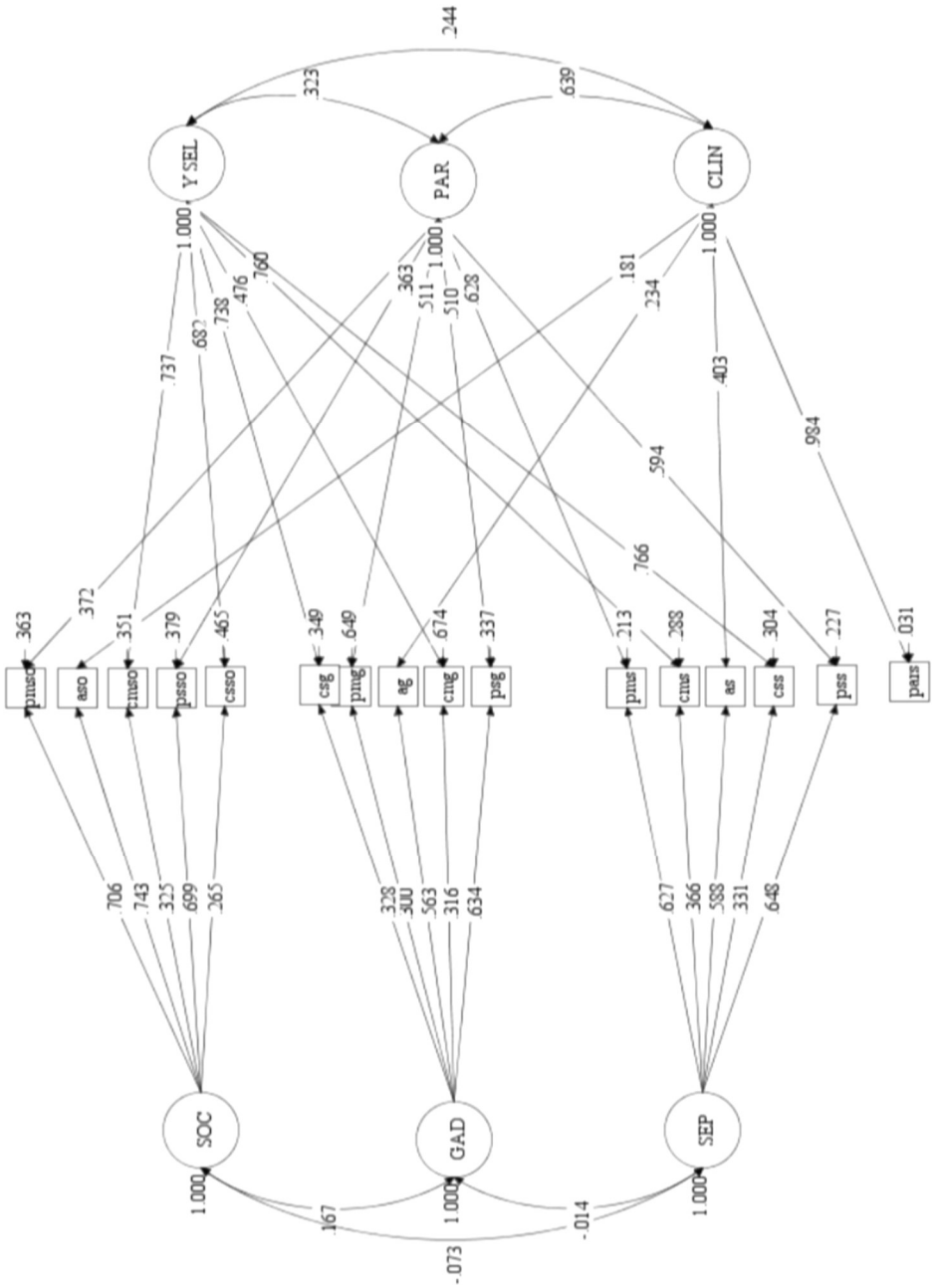

Figure 4.1
CTCM Model with standardized estimates.

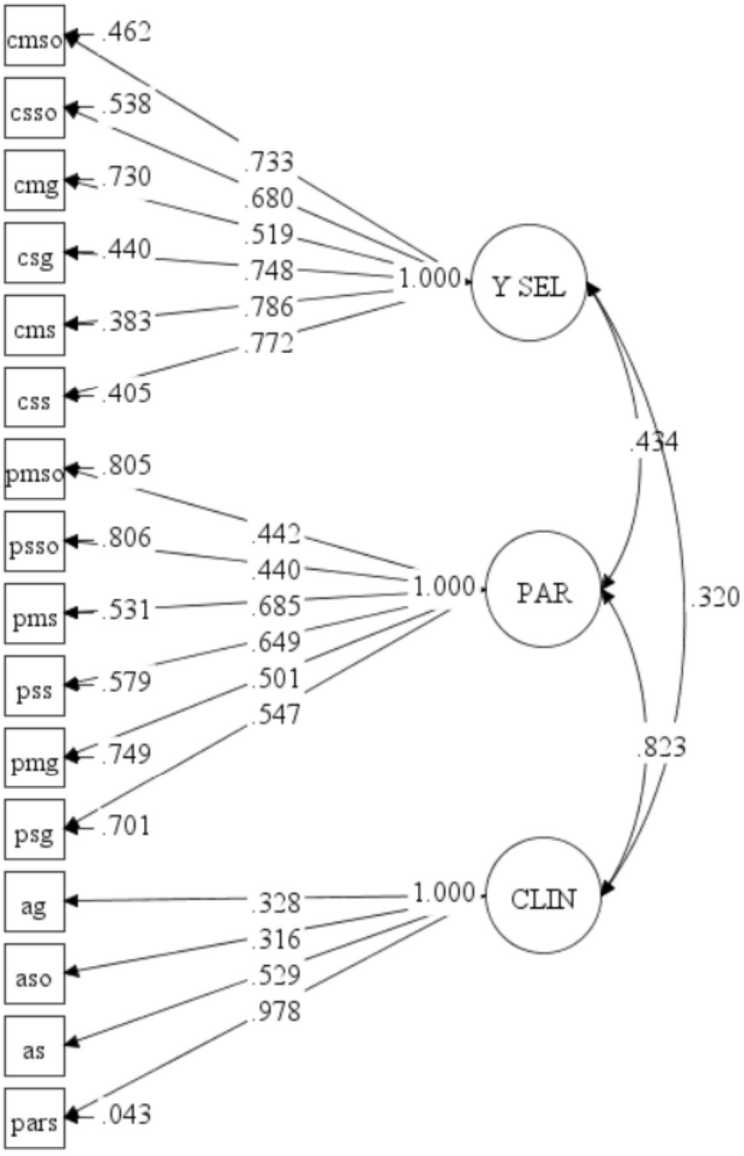

Figure 4.2
NTCM MTMM Model with standardized estimates.

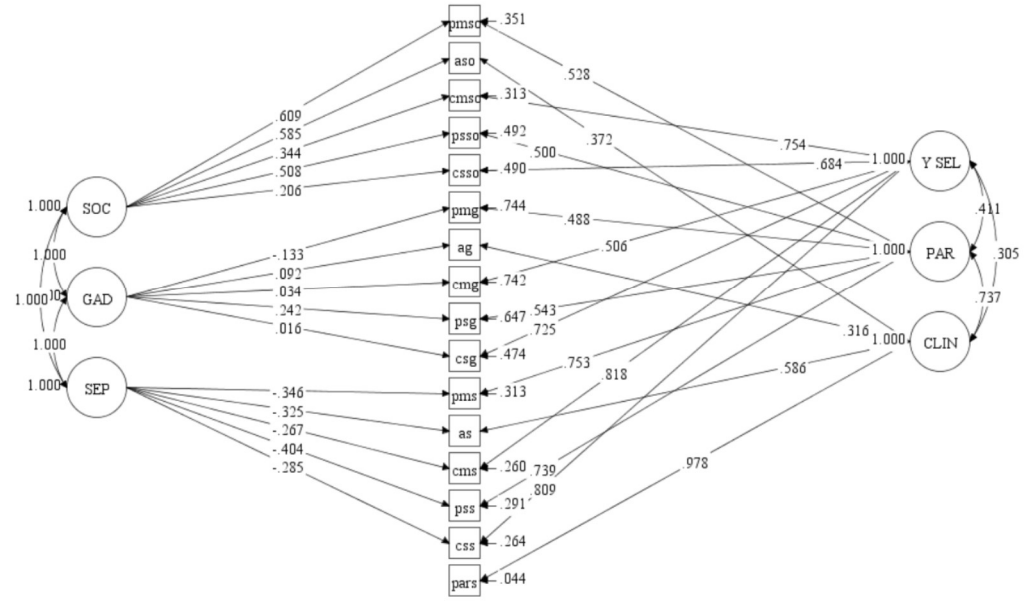

Figure 4.3
PCTCM MTMM Model with standardized estimates.

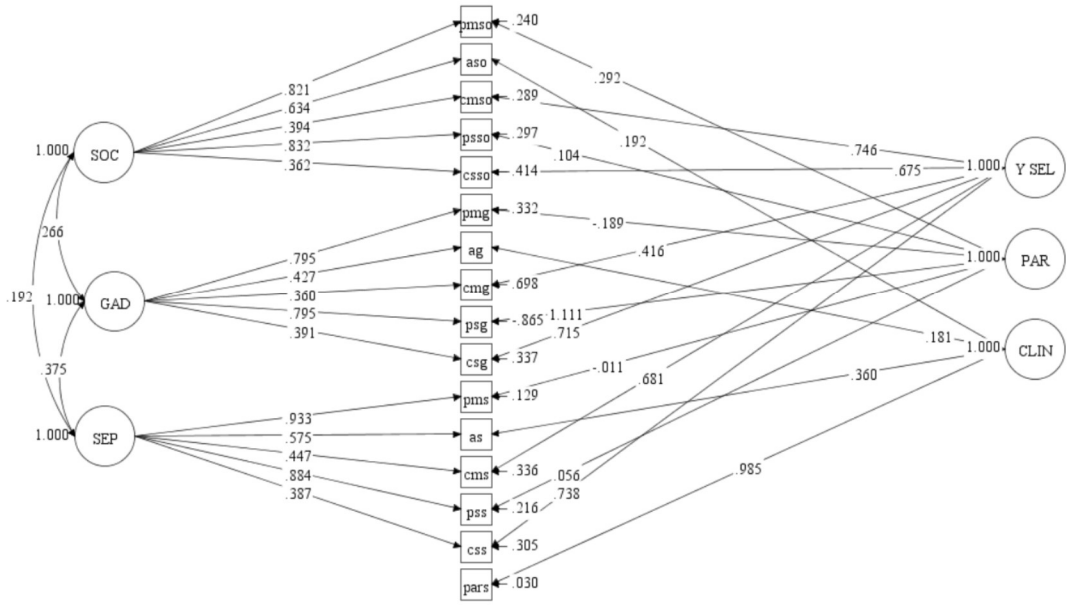

Figure 4.4
CTUM MTMM model with standardized estimates.

Table 4.8 shows method loadings exceeded trait loadings for all self-report measures. This suggests that the evidence of convergent validity of traits may be reduced at the individual parameter level by method effects related to self-report ratings. Notably, however, the trait loadings exceeded method loadings for all parent report measures except the GAD indicator of the MASC, which the researcher identified as potentially problematic from the outset based on the lack of a true GAD subscale. Finally, trait loadings exceeded method loadings for all clinician reported measures.

Table 4.8
Standardized Estimates of Trait and Method Loadings CFA MTMM Model 1 (Correlated Traits/Correlated Methods)

	SEP	GAD	SOC	CHILD	PARENT	CLIN.
Self-Ratings						
MASC-C: Separation	0.366			0.760		
MASC-C: GAD		0.316		0.476		
MASC-C: Social			0.325	0.737		
SCARED-C: Separation	0.331			0.766		
SCARED-C: GAD		0.328		0.738		
SCARED-C: Social			0.265	0.682		
Parent-Ratings						
MASC –P: Separation	0.627				0.628	
MASC –P: GAD		.300			0.511	
MASC –P: Social			0.706		0.372	
SCARED –P: Separation	0.648				0.594	
SCARED –P: GAD		0.634			0.510	
SCARED –P: Social			0.699		0.363	
Clinician Ratings						
ADIS - Separation	0.588					0.403
ADIS -GAD		0.563				0.234
ADIS -Social			0.743			0.181
PARS						0.984

Table 4.9 shows that discriminant validity for the three anxiety traits is supported because the correlations among trait factors are not significant. Significant correlations among method factors suggest that different raters' reports of youth anxiety are not as dissimilar as anticipated. The covariance between the parent report factor and the clinician report factor was higher than that found between either of those factors and the child report factor.

The significant (though albeit, low) correlation between self and parent reports may be attributed to the fact that the specific items comprising each of the subscales were almost identical for parent and child measures. The correlation between parent and clinician reports could be a function of the fact that clinicians based their ratings for the CSRs more heavily on parent reports since this subsample is comprised of younger children who may be viewed as under-reporting or having less insight into their internal processes.

Table 4.9
Trait and Method Correlations for CTCM CFA MTMM Model 1

	SEP	GAD	SOC	SELF	PARENT	CLINICIAN
SEP	1.0					
GAD	-0.014	1.0				
SOC	-0.073	0.167	1.0			
SELF				1.0		
PARENT				0.323*	1.0	
CLINICIAN				0.244*	0.639*	1.0

The last step in the analysis was testing Model 1 for configural invariance by gender groups. Due to sample size constraints, and the fact that there wasn't at least one participant at every level (0-8) of the ordinal ADIS CSR variable for both boys and girls in the younger subsample, this gender analysis was completed for the whole sample. When examined separately in the same model, results showed that the chi-square contribution from females in the sample was 300.045 while the chi-square contribution from males was 382.716. Further, RMSEA for this model was estimated to be .083 (CFI=0.740) suggesting worse model fit than when gender was not divided, and a lack of configural invariance. The male and female subsamples were thus analyzed separately to obtain a more accurate picture of model fit for boys and girls. RMSEA for the boys only model was 0.086 (CFI=0.788). When the girls were analyzed alone, RMSEA was calculated to be 0.071and CFI was 0.867, suggesting better model fit for the girls.

There do appear to be gender differences in how the model fits for male and female participants, but it is important to note that both models have borderline acceptable fit. Therefore, while the model is adequate for both genders when the whole sample is examined, there is some evidence that it may not be measuring the same constructs in the exact same way across gender groups. Because there was no evidence for configural invariance, tests of metric invariance and scalar invariance were not pursued further.

CHAPTER 5: DISCUSSION

Purpose and Goal

Among children, anxiety disorders comprise the most common mental health diagnoses. Anxiety interferes with children's functioning, and is a risk factor for the development of later psychopathology. It is crucial that clinicians utilize quality tools to diagnose and conceptualize youth anxiety because excellent evidence-based treatments are available (cognitive behavioral therapy).

The DSM-V classification system specifies subtypes of youth anxiety including those known as the "big three" anxiety disorders (generalized anxiety disorder (GAD), social phobia and separation anxiety). Because of high levels of comorbidity among these three anxiety disorders, and a great deal of symptom overlap, researchers have questioned if these separate anxiety disorders can be reliably differentiated in children. The purpose of this study was to use confirmatory factor analysis (CFA) methods to investigate construct validity of the big three anxiety disorders in a sample of clinically-anxious youth.

It is widely accepted that data from multiple informants is best-practice for accurate and effective assessment of anxiety. Available measures provide clinicians with information about symptoms, severity and diagnoses from multiple perspectives. However, there is no gold-standard method for aggregating data from multiple informants. In fact, gathering and trying to make sense of reports from multiple informants is quite burdensome.

Review of Findings

The current study examined 16 indicators of baseline youth anxiety in a clinical sample (6 self-reports, 6 parent reports, and 4 clinician reports). Overall patterns by developmental level confirmed expected hypotheses; adolescents (age 11-17) reported more social phobia than children (age 7-10), who reported more separation anxiety. Both groups were measured as having similar levels of GAD. Patterns by gender also confirmed expected findings. Girls reported significantly more anxiety than boys for four of the six self-reported indicators (the other two indicators were equally endorsed by participants of both genders). Similarly, parents of girls rated their daughters as having more anxiety symptoms for three of the six parent reported indicators. Another expected finding was confirmed on the MASC and SCARED informant-report scales, as parents reported more symptoms than their children. Interestingly, there were no gender differences for any of the clinician reported indicators.

An examination of parent-child concordance showed the highest correlations for measures of separation anxiety, followed by social phobia, and finally, GAD. Results suggest that parents and their children generally agree more about symptoms of separation anxiety and social phobia than they do about GAD. This may be because the former two, by definition, have a clearer cluster of symptoms. Concordance on measures of GAD were lower than what was expected based on previous research. In general, adolescent reports and female self-reports were more highly correlated with parent reports than those of boys and younger children. This is important to note because research has shown that superior treatment gains are found when there is higher initial concordance between parents and children at baseline.

When correlations between indicators were examined, convergent validity for traits was supported because the measures loading onto each trait factor were all significantly correlated with one another. Notably, correlations among social phobia and separation anxiety indicators were stronger than those among indicators of GAD. Discriminant validity for traits was only partially supported because parent reports for GAD were weakly but significantly correlated with child report measures for the other disorders. This finding may be a product of the GAD construct containing elements of both separation anxiety and social phobia. Alternatively, it may also be related to a failure to accurately measure GAD. Because the MASC did not have a GAD specific subscale, the researcher chose to use two subscales that are conceivably related to GAD (physical/somatic symptoms and perfectionism/anxious coping) as a combined indicator of GAD. The authors of the MASC advocate for using the total score of the MASC as an indicator of GAD, instead, but that was not used in this analysis, partially due to inherently inflated correlations between the MASC-total (GAD) and the other two MASC subscales. The correlation between the MASC-P total score and the MASC-P subscale scores for separation anxiety and social phobia are r=0.538 and r=0.645 respectively.

Unexpectedly, indicators in the model correlated weakly with the PARS. Although the PARS is a global measure of severity, the researcher expected it to be associated with specific indicators of symptom clusters by anxiety subtype. Notably, when the correlation between the PARS and the Total Score for the MASC-P was examined, a moderate significant correlation was found (r=.414). This suggests that the PARS may be a better indicator of a global or total anxiety factor than of one or more trait factors. Although the PARS was a somewhat problematic indicator, it was retained in the model because it is so

often used in clinical practice and the researcher sought to determine its relative level of contribution to latent anxiety factors. In the initial MTMM analysis with the younger subsample, the residual variance of the PARS was fixed to 0.6 in order to resolve an estimate of negative residual variance.

The first research question sought to address the conceptualization of anxiety and see if there was more evidence for three trait factors or one general factor. For this part of the analysis, data for the younger subsample was estimated alone. Support for convergent validity was evidenced by better fit for the data in a model specifying three traits than a model specifying no traits. Further support for discriminant validity was found because the model with freely correlated traits fit the data better than a model where the traits were constrained to be perfectly correlated.

The second research question sought to examine discriminant validity among raters and determine which informant/method provides the most accurate information about latent anxiety among children in the 7-10 year-old age range before the initiation of treatment. The researcher concluded that self-reports, parent reports and clinicians' ratings each provide unique information about the anxiety traits. However, significant correlations among method factors suggest that different raters' reports of youth anxiety are not as dissimilar as anticipated. The weak, significant correlation between self and parent reports may be explained by the fact that the child and parent report versions of questionnaires with the same items were assessed for this study. The relationship between parent and clinician reports is stronger than anticipated. It does not exceed the cutoff criterion of .85, which would indicate problematic discriminant validity, but given the overlap, it raises

questions about if the clinician raters are truly subjective or if they may weigh parent information more heavily when assigning their ratings.

Parent reports had the strongest loadings on the trait factors of separation anxiety and GAD within the younger subsample, suggesting that they should prioritized over self-reports for anxiety assessment with younger children. As discussed in the literature review, younger children often under-report symptoms for a variety of reasons; their parents are likely more accurate reporters of symptoms. For social phobia, the ADIS clinician rating had the strongest factor loading. Of the big three anxiety disorders, social phobia may be the most private, and the hardest for parents of young children to uncover. They make think their child is "shy" or "quiet" and not be aware of all the social situations in which their child is shutting down because they are expecting the worst possible outcome. It makes sense that a detailed clinical interview combining information from youth and their parents would be the most accurate in this context.

The third research question focused on the utility of specific measures for predicting each type of anxiety. Results of the study showed that the SCARED parent report of separation anxiety loaded highest on the separation trait. Similarly, the SCARED parent report for GAD loaded highest on that trait. For social phobia, the ADIS clinician report and both the MASC and SCARED parent reports for social phobia had the highest loadings. This is valuable information because the SCARED questionnaire is the least time-consuming measure and the easiest to score.

The last research questions examined differences in model fit by developmental age and gender. Results suggest that the CTCM model fit the data for girls and for younger children better than the data for boys and for older children. There do appear to be

differences in how the model fits for male and female participants, and for older and younger participants. However, it is important to note that all models have borderline acceptable fit.

Limitations

This analysis had a few limitations which should be noted. Because the ADIS was considered an ordinal categorical variable, the WLSMV estimator was used rather than the more common ML estimator. In addition, although it was only a small proportion of the cases, there was some missing data. The most missing cases were on the GAD indicator for the MASC, which proved to be one of two somewhat problematic indicators in the model.

The MASC was potentially problematic for a few reasons. First, the MASC used in this study is outdated because the MASC-2 has been released. Secondly, the items that contributed to the MASC GAD indicator were taken from two subscales on the MASC that are related to GAD but may not be the best measures of the construct. Namely, items regarding tense/restless feelings, somatic/autonomic symptoms, perfectionism, and anxious coping were considered together as a substitute for a GAD factor. Considering Rey (2011) found a lack of validity for GAD and advocated separating it into a "worry" factor and a "somatic distress" factor, an interesting future research question could examine the acceptability of a model with four trait factors.

The PARS measure was also somewhat problematic. A limitation of this study is that there was not a specific severity measure for each of the anxiety traits, and the researcher included a global severity measure along with several symptom-specific measures. The PARS was retained in the model as a second clinician-factor because it is

one of the most common treatment outcome variables utilized in the literature. However, the PARS residual variance had to be constrained, which likely caused the PARS to be overestimated and the ADIS underestimated in the model.

Finally, while this data set can be considered large, it contained an overrepresentation of Caucasian youth, and many more mother-reporters than other caregiver informants. In addition, because ethnicity and race were coded differently in the two samples, it is likely that the proportion of Hispanic participants reported is an underestimate of the true number of Hispanic individuals in the sample. Future research should consider potential variations in patterns of concordance among raters by ethnicity and reporter-child relationship.

Implications.

This project has implications for both clinicians and researchers. Clinicians who encounter children presenting for anxiety treatment should feel confident that there really are three distinct anxiety disorder diagnoses, but also expect that most children meet criteria for more than one anxiety disorder. Clinicians should also expect that children will not be as accurate reporters of their symptoms as their parents. However, they should expect that child reports will provide non-redundant information useful for case conceptualization. Because both the MASC and SCARED demonstrated fairly consistent factor loadings with one another, it is likely that using one questionnaire would be sufficient. Based on this analysis, the researcher recommends the SCARED over the MASC. While the ADIS interview does provide clinically important information for diagnostic and treatment planning purposes, it may be unnecessary if the goal of assessment is to gain more information about symptoms in the presence of a previous

diagnosis. Further, in the absence of a previous diagnosis, when parent report on the SCARED suggests elevations on the separation anxiety or social phobia subscales, a diagnosis may be confirmed with a much shorter clinical interview than the ADIS.

For researchers interested in MTMM analyses and construct validity of anxiety disorders in youth, this project provides a variety of questions and potential new directions. For example, future research could examine a longitudinal MTMM design, looking at the construct validity of different measures across time by combining information provided by multiple reporters in a single model (Koch, Schultze, Eid, & Geiser, 2014). Additional projects could also examine model fit for the adolescent group more closely, or examine increasingly homogenous subgroups such as "adolescent females" or "middle childhood participants with comorbid ADHD". The question of fit of a potential bifactor model for anxiety within the MTMM framework has also not been addressed. In initial attempts to examine a potential global anxiety factor on the same level as the three more specific anxiety traits, the researcher was not able to obtain an identified model. Further, future researchers could examine potential higher order MTMM models, or re-examine this data using the CT-C(M-1) model or a different estimator. Researchers may also wish to use the SCARED parent reports as future indicators in path model investigations of a variety of influences on latent anxiety.

Conclusion.

Given the frequency of anxiety symptoms in children and the burden of combining assessment information from multiple reporters, it is important to resolve whether symptoms represent three distinct trait patterns (the big three anxiety disorders) and whether informants provide unique or redundant information. The aim of this study was to

evaluate the construct validity of three childhood anxiety disorders using MTMM models. According to Brown (2015), there is a great risk for nonconvergence in a correlated methods CFA for MTMM data as these types of models produce improper solutions most of the time. However, the data for the middle childhood sample converged normally and resulted in moderately good fit for the CTCM model. This model was a significantly better fit to the data than any alternative model. Therefore, the present study supports the current conceptualization of these anxiety disorders as related, yet distinct entities. It also suggests that each method used to assess anxiety offers a related but unique perspective. The present research confirms and extends previous findings by Langer et al. (2010).

APPENDIX

DSM-5 Diagnostic Criteria for Anxiety Disorders

Separation Anxiety Disorder (APA, 2013, p.190)
309.21 (F93.0).
Diagnostic Criteria.

A. Developmentally inappropriate and excessive fear or anxiety concerning separation from those to whom the individual is attached, as evidenced by at least three of the following:

1. Recurrent excessive distress when anticipating or experiencing separation from home or from major attachment figures.
2. Persistent or excessive worry about losing major attachment figures or about possible harm to them, such as illness, injury, disasters, or death.
3. Persistent and excessive worry about experiencing an untoward event (e.g., getting lost, being kidnapped, having an accident, becoming ill) that cause separation from a major attachment figure.
4. Persistent reluctance or refusal to go out, away from home, to school, to work, or elsewhere because of fear of separation.
5. Persistent and Excessive fear of or reluctance about being alone or without major attachment figures at home or in other settings.
6. Persistent reluctance or refusal to sleep away from home or to go to sleep without being near a major attachment figure.
7. Repeated nightmares involving the theme of separation.
8. Repeated complaints of physical symptoms (e.g., headaches, stomachaches, nausea, vomiting) when separation from major attachment figures occurs or is anticipated.

B. The fear anxiety, or avoidance is persistent, lasting at least 4 weeks in children and adolescents and typically 6 months or more in adults.

C. The disturbance causes clinically significant distress or impairment in social, academic, occupational, or other important areas of functioning.

D. The disturbance is not better explained by another mental disorder, such as refusing to leave home because of excessive resistance to change in autism spectrum disorder; delusions or hallucinations concerning separation in psychotic disorders; refusal to go outside without a trusted companion in agoraphobia; worries about ill health or other

harm befalling others in generalized anxiety disorder, or concerns about having an illness in illness anxiety disorder.

Generalized Anxiety Disorder (APA, 2013, p.222)
300.02 (F41.1).
Diagnostic Criteria.

A. Excessive anxiety and worry (apprehensive expectation), occurring more days than not for at least 6 months, about a number of events or activities (such as work or school performance).

B. The individual finds it difficult to control the worry.

C. The anxiety and worry are associated with three (or more) of the following six symptoms (with at least some symptoms having been present for more days than not for the past 6 months):
Note: In children, only one item is required.
1. Restlessness or feeling keyed up or on edge.
2. Being easily fatigued.
3. Difficulty concentrating or mind going blank.
4. Irritability.
5. Muscle tension.
6. Sleep disturbance (difficulty falling or staying asleep or restless, unsatisfying sleep).

D. The anxiety, worry, or physical symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

E. The disturbance is not attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition (e.g., hyperthyroidism).

F. The disturbance is not better explained by another mental disorder (e.g., anxiety or worry about having panic attacks in panic disorder, negative evaluation in social anxiety disorder [social phobia], contamination or other obsessions in obsessive-compulsive disorder, separation from attachment figures in separation anxiety disorder, reminders of traumatic events in posttraumatic stress disorder, gaining weight in anorexia nervosa, physical complaints in somatic symptom disorder, perceived appearance flaws in body dysmorphic disorder, having a serious illness in illness anxiety disorder, or the content of delusional beliefs in schizophrenia or delusional disorder).

Social Anxiety Disorder (Social Phobia) (APA, 2013, p.202)
300.23 (F40.10).
Diagnostic Criteria.

A. Marked fear or anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others. Examples include social interactions (e.g., having a conversation, meeting unfamiliar people), being observed (e.g., eating or drinking), and performing in front of others (e.g., giving a speech).
Note: In children, the anxiety must occur in peer setting and not just during interactions with adults

B. The individual fears that he or she will act in a way or show anxiety symptoms that will be negatively evaluated (i.e., will be humiliating or embarrassing; will lead to rejection or offend others).

C. The social situations almost always provoke fear or anxiety.
Note: In children, the fear or anxiety may be expressed by crying, tantrums, freezing, clinging, shrinking, or failing to speak in social situations.

D. The social situations are avoided or endured with intense fear or anxiety.

E. The fear or anxiety is out of proportion to the actual threat posed by the social situation and to the sociocultural context.

F. The fear, anxiety, or avoidance is persistent, typically lasting for 6 months or more.

G. The fear, anxiety, or avoidance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

H. The fear, anxiety, or avoidance is not attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition.

I. The fear, anxiety, or avoidance is not better explained by the symptoms of another mental disorder, such as panic disorder, body dysmorphic disorder, or autism spectrum disorder.

J. If another medical condition (e.g., Parkinson's disease, obesity, disfigurement from burn or injury) is present, the fear, anxiety, or avoidance is clearly unrelated or is excessive.

GLOSSARY

Abbreviated Model Variables Defined

AG: Clinician Severity Rating (CSR) for Generalized Anxiety Disorder based on the Anxiety Disorder Interview Schedule: Children/Parent versions (ADIS: C/P)

AS: CSR for Separation Anxiety based on the ADIS: C/P

ASO: CSR for Social Phobia based on the ADIS: C/P

PARS: Clinician-rated total score on the Pediatric Anxiety Rating Scale based on 9 severity items.

PMG: Multidimensional Anxiety Scale for Children Parent report (MASC-P) score for items contributing to the Tense symptoms, Somatic symptoms, Perfectionism, and Anxious Coping Subscales (21 items).

PMS: MASC-P score for the Separation/Panic Scale (9 items).

PMSO: MASC-P score for the Social Anxiety Scale (9 items).

PSG: Screen for Child Anxiety and Related Disorders Parent report (SCARED-P) score for the GAD subscale (9 items).

PSS: SCARED-P score for the Separation Anxiety Disorder subscale (8 items).

PSSO: SCARED-P score for the Social Anxiety Disorder subscale (7 items).

CMG: MASC-C for items contributing to the Tense symptoms, Somatic symptoms, Perfectionism, and Anxious Coping Subscales (21 items).

CMS: MASC-C for the Separation/Panic Scale (9 items).

CMSO: MASC-C for the Social Anxiety Scale (9 items).

CSG: SCARED-C score for the GAD scale (9 items).

CSS: SCARED-C score for the Separation Anxiety Disorder scale (8 items).

CSSO: SCARED-C score for the Social Anxiety Disorder scale (7 items).

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